



# OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

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**DIRECTIVE NUMBER:** CPL 02-02-074 | **EFFECTIVE DATE:** January 24, 2008

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**SUBJECT:** Inspection Procedures for the Chromium (VI) Standards

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## ABSTRACT

- Purpose:** The purpose of this Instruction is to provide guidelines and establish uniform inspection and compliance procedures for the occupational exposure standards for hexavalent chromium published in the Federal Register, February 28, 2006, and effective May 30, 2006, and as corrected in the Federal Register, June 23, 2006, and as amended for general industry in the Federal Register, October 30, 2006. This Instruction is not a standard, regulation, or any other type of substantive rule. No statement in this Instruction should be construed to require the regulated community to adopt any practices, means, methods, operations, or processes beyond those which are already required by the Occupational Safety and Health Act of 1970 (OSH Act) (29 USC § 668) or standards and regulations promulgated under the OSH Act.
- Scope:** This Instruction applies OSHA-wide.
- References:** Federal Register, [71 FR 10099-10385](#), §§ 1910, 1915, 1917, 1918, 1926, *Occupational Exposure to Hexavalent Chromium*, February 28, 2006.
- Federal Register, [71 FR 36008-36010](#), §§ 1910, 1915, 1926, *Occupational Exposure to Hexavalent Chromium; Corrections*, June 23, 2006.
- Federal Register, [71 FR 63238-63245](#), § 1910, *Occupational Exposure to Hexavalent Chromium*, October 30, 2006.
- Cancellations:** OSHA Memorandum to Regional Administrators, *Interim Guidelines until Publication of Final OSHA Instruction, Inspection Guidelines for the Hexavalent Chromium Standards*, June 23, 2006.

OSHA Instruction CPL 02-02-026, 29 CFR 1910.1000, Table Z-2 Citation Policy for Chromates and Chromic Acids, September 5, 1980.

As part of the directive revision process, OSHA has removed and archived interpretations from its public website that no longer reflect current policy and/or are superseded by this OSHA Instruction.

**State Impact:** Notice of intent required. States are expected to have accessible enforcement policies and procedures in place which are at least as effective as those in this Instruction.

**Action Offices:** National, Regional and Area Offices, and On-site Consultation Project Managers.

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By and Under the Authority of

Edwin G. Foulke, Jr.  
Assistant Secretary

## Executive Summary

This new Chromium (VI) Directive addresses enforcement procedures for the new Chromium (VI) standards published in the Federal Register (FR) on February 28, 2006. On that date, OSHA issued three standards for hexavalent chromium (also written as chromium (VI) and abbreviated as Cr(VI)), adding three new sections to the Code of Federal Regulations (CFR) as Sections 29 CFR 1910.1026, 29 CFR 1926.1126, and 29 CFR 1915.1026, applicable to general industry, construction, and shipyards, respectively. All three standards were effective May 30, 2006. Employers with 20 or more employees were allowed six months, until a start-up date of November 27, 2006, to come into compliance with most of the provisions of the standards. Employers with 19 or fewer employees were allowed 12 months, until a start-up date of May 30, 2007, to come into compliance with most of the provisions. All employers were allowed four years from the effective date, a deadline of May 31, 2010, to install feasible engineering controls. The general industry standard, 29 CFR 1910.1026, also includes an appended settlement agreement with the Surface Finishing Industry Council (SFIC).

This new Directive provides policy and guidance for enforcement of all three Cr(VI) standards, and implementation of these enforcement procedures shall begin on the effective date of this Directive. Special policies are also provided for enforcement until May 31, 2010, when employers must comply with requirements for feasible engineering and work practice controls. The new Cr(VI) standards have lowered the permissible exposure limit (PEL) to  $5 \mu\text{g}/\text{m}^3$  and established an action level of  $2.5 \mu\text{g}/\text{m}^3$ .

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## **I. Purpose.**

The purpose of this Instruction is to provide guidelines and establish uniform inspection and compliance procedures for the occupational exposure standards for hexavalent chromium published in the Federal Register, February 28, 2006, and effective May 30, 2006. A minor correction to the standards was published in the Federal Register, June 23, 2006, and an amendment to the general industry standard was published in the Federal Register on October 30, 2006, as a result of a settlement agreement for electroplating facilities. This Instruction will herein be referred to as the Chromium (VI) Directive, or the Cr(VI) Directive.

In order to effectively enforce safety and health standards, guidance to compliance staff is necessary. Where guidance in this Instruction directs a compliance safety and health officer (“CSHO” or compliance officer) to perform a specific inspection action by using the word “shall,” the compliance officer will make every effort to perform the action unless it does not apply to the specific employer, or unless there is some other reason approved by the Area Director and documented in the inspection report. Any such inspection action that is not performed by the compliance officer shall in no way affect the regulated community’s legal obligations required by the OSH Act or by standards and regulations promulgated under the OSH Act.

## **II. Scope.**

This Instruction applies OSHA-wide.

## **III. References.**

71 FR 10099-10385, §§ 1910, 1915, 1917, 1918, 1926, [Occupational Exposure to Hexavalent Chromium, February 28, 2006.](#)

71 FR 36008-36010, §§ 1910, 1915, 1926, [Occupational Exposure to Hexavalent Chromium; Corrections, June 23, 2006.](#)

71 FR 63238-63245, § 1910, [Occupational Exposure to Hexavalent Chromium, October 30, 2006.](#)

71 FR 50121-50192, §§ 1910, 1915, 1926, [Assigned Protection Factors; Final Rule, August 24, 2006.](#)

59 FR 40960-411162, §§ 1910, 1915, 1926, [Occupational Exposure to Asbestos, August 10, 1994.](#)

46 FR 4078-4179, § 1910, [Occupational Noise Exposure; Hearing Conservation Amendment, January 16, 1981.](#)

29 CFR 1910.1026, [Chromium \(VI\)](#); 29 CFR 1915.1026, Chromium (VI); 29 CFR 1926.1126, Chromium (VI).

29 CFR 1910.1000, [Air contaminants](#); 29 CFR 1915.1000, Air contaminants; 29 CFR 1926.55, Gases, vapors, fumes, dusts, and mists.

29 CFR 1910, Subpart Q, [Welding, Cutting and Brazing](#); 29 CFR 1915, Subpart D, Welding, Cutting and Heating; 29 CFR 1917.152, Welding, cutting and heating (hot work); 29 CFR 1926, Subpart J, Welding and Cutting.

29 CFR 1910.1025, [Lead](#); 29 CFR 1915.1025, Lead; 29 CFR 1926.62, Lead.

29 CFR 1910.1018, [Inorganic arsenic](#); 29 CFR 1915.1018, Inorganic arsenic; 29 CFR 1926.1118, Inorganic arsenic.

29 CFR 1910.141, [Sanitation](#); 29 CFR 1915.97, Health and sanitation; 29 CFR 1926.51, Sanitation.

29 CFR 1910.134, [Respiratory protection](#); 29 CFR 1915.154, Respiratory protection; 29 CFR 1917.92, Respiratory protection; 29 CFR 1918.102, Respiratory protection; 29 CFR 1926.103, Respiratory protection.

29 CFR 1910, Subpart I, [Personal protective equipment](#); 29 CFR 1915, Subpart I, Personal protective equipment, 29 CFR 1926, Subpart E, Personal protective and life saving equipment.

29 CFR 1910.1020, [Access to employee exposure and medical records](#).

29 CFR 1910.1200, [Hazard communication](#); 29 CFR 1915.1200, Hazard communication; 29 CFR 1917.28, Hazard communication; 29 CFR 1918.90, Hazard communication; 29 CFR 1926.59, Hazard communication.

29 CFR 1926.21, [Safety training and education](#).

29 CFR 1915.91, [Housekeeping](#); 29 CFR 1917.11, Housekeeping; 29 CFR 1918.91, Housekeeping; 29 CFR 1926.25, Housekeeping.

29 CFR 1910.94, [Ventilation](#); 29 CFR 1926.57, Ventilation.

29 CFR 1910.123, [Dipping and coating operations](#): Coverage and definitions; 29 CFR 1910.124, General requirements for dipping and coating operations; 29 CFR 1926.57, Ventilation.

29 CFR 1910.151, [Medical services and first aid](#); 29 CFR 1917.95, Other protective measures; 29 CFR 1926.50, Medical services and first aid.



29 CFR 1910.1027, [Cadmium](#).

29 CFR 1910.1051, [1,3-Butadiene](#).

29 CFR 1910.1052, [Methylene Chloride](#).

29 CFR 1915.34, [Mechanical paint removers](#).

29 CFR Part 1904, [Recording and Reporting Occupational Injuries and Illnesses](#).

OSHA Instruction CPL 02-00-032, [Maritime Standard Alleged Violation Elements \(SAVEs\) Manual](#), December 21, 1983, and subsequent changes.

OSHA Instruction CPL 02-00-034, [Construction SAVEs Manual](#), September 1, 1979, and subsequent changes.

OSHA Instruction CPL 02-00-035, [Regulatory and General Industry SAVEs Manual](#), September 1, 1979, and subsequent changes.

OSHA Instruction CPL 02-00-103, [Field Inspection Reference Manual \(FIRM\)](#), September 26, 1994. (Note: As of the date of publication of this Instruction, the FIRM is under revision/update.)

OSHA Instruction CPL 02-00-120, [Inspection Procedures for the Respiratory Protection Standard](#), September 25, 1998.

OSHA Instruction CPL 02-02-072, [Rules of Agency Practice and Procedure Concerning OSHA Access to Employee Medical Records](#), August 22, 2007.

OSHA Instruction CPL 02-02-038, [Inspection Procedures for the Hazard Communication Standard](#), March 20, 1998.

OSHA Instruction CPL 02-02-054, [Respiratory Protection Program Guidelines](#), July 14, 2000.

OSHA Instruction CPL 03-00-006, [Combustible Dust National Emphasis Program](#), October 18, 2007.

OSHA Instruction CSP 02-01-001, [Consultation for Wood Treatment Operations Utilizing Inorganic Compounds](#), September 9, 1986.

OSHA Instruction PER 04-00-003, [CSHO Medical Examinations](#), March 31, 1989.

OSHA Instruction STD 03-08-001, [Welding, Cutting or Heating of Metals Coated with Lead-Bearing Paint](#), October 30, 1978.

OSHA Instruction TED 01-00-015, [OSHA Technical Manual \(OTM\)](#), January 20, 1999.

OSHA Publication 3320-10N, *Small Entity Compliance Guide for the Hexavalent Chromium Standards*, 2006.

OSHA Safety and Health Information Bulletin 07-31-2005, *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions*.

OSHA *Settlement Agreement with the Surface Finishing Industry Council (SFIC)*, et al., October 25, 2006.

OSHA *Settlement Agreement with the Building and Construction Trades Department (BCTD)*, AFL-CIO, et al., April 6, 2007.

OSHA *Settlement Agreement with the National Association of Manufacturers (NAM)*, et al., May 21, 2007.

OSHA Website, *OSHA Safety and Health Topics: Hexavalent Chromium*, <http://www.osha.gov/SLTC/hexavalentchromium/index.html>.

NIOSH Website, *NIOSH Safety and Health Topic: Hexavalent Chromium*, <http://www.cdc.gov/niosh/topics/hexchrom/>.

NIOSH *Pocket Guide to Chemical Hazards*, DHHS (NIOSH) Publication No. 2005-151, September 2005.

NIOSH *Occupational Exposure Sampling Strategy Manual*, Publication No. 77-173, January 1977.

NIOSH *Criteria for a Recommended Standard on Welding, Brazing, and Thermal Cutting*, Publication No. 88-110, April 1988.

#### **IV. Cancellations.**

OSHA Memorandum to Regional Administrators, *Interim Guidelines until Publication of Final OSHA Instruction, Inspection Guidelines for the Hexavalent Chromium Standards*, June 23, 2006.

OSHA Instruction CPL 02-02-026, *29 CFR 1910.1000, Table Z-2 Citation Policy for Chromates and Chromic Acids*, September 5, 1980.

As part of the directive revision process, OSHA has removed and archived letters of interpretation concerning hexavalent chromium from its public website that no longer reflect current policy and/or are superseded by this OSHA Instruction.

#### **V. Action Offices.**

A. Responsible Office. Office of Health Enforcement (OHE).

- B. Action Offices. OSHA National, Regional and Area Offices, and On-site Consultation Project Managers.
- C. Information Offices. State Designees, National Institute for Occupational Safety and Health (NIOSH), Regional Program Directors, 7(c)(1) Project Managers.

## VI. **Federal Program Change.**

- A. Chromium (VI) Directive. This Instruction describes a Federal program change which establishes policies and procedures necessary for the enforcement of the Cr(VI) standards. States are required to establish implementing enforcement policies and procedures which are at least as effective as those in this Instruction and which must be available for review. States are required to notify OSHA whether they intend to adopt identical enforcement policies and procedures or different policies and procedures in response to this Instruction.

If the State adopts policies and procedures that differ from the Federal, the State may either post its different policy on its State plan website and provide the link to OSHA or provide a copy to OSHA with information on how the public may obtain a copy. If the State adopts identical policies and procedures, it must provide the date of adoption to OSHA. In responding to this Directive, States must separately specify their intended action regarding the settlement agreements described below.

- B. Settlement Agreements. OSHA strongly encourages States that cover the private sector to implement enforcement policies and procedures that result from any settlement agreements that OSHA makes with parties that filed legal challenges to the Cr(VI) standards.
  1. On October 25, 2006, OSHA settled with the Surface Finishing Industry Council (SFIC), resulting in special enforcement policies and procedures for participant electroplating facilities in Federal states. States are encouraged to honor and implement the terms of the [SFIC Settlement Agreement](#), including the standard's amendment, or to enter into separate arrangements with surface- and metal-finishing job shops (or their representatives) in their jurisdiction.
  2. On April 6, 2007, OSHA settled with the Building and Construction Trades Department (BCTD), AFL-CIO, Laborers' International Union of North America, and International Brotherhood of Teamsters, resulting in special enforcement procedures for construction site inspections where employees are exposed to portland cement. States are required to establish enforcement policies and procedures regarding portland cement which are at least as effective as those in the [BCTD Settlement Agreement](#), which are explained in [Appendix C](#) of this Instruction.
  3. On May 21, 2007, OSHA settled with the National Association of Manufacturers (NAM) and the Specialty Steel Industry of North America

(SSINA). The [NAM Settlement Agreement](#) resulted in a letter of interpretation concerning, among other issues, the feasibility of implementing engineering controls for welding on stainless steel inside confined and enclosed spaces. State interpretations are expected to be at least as effective as the Federal letter of interpretation.

- C. **Chromium (VI) Standards.** States were required to adopt standards at least as effective as OSHA's new Cr(VI) standards by August 28, 2006. States were not required to adopt the amendment issued on October 30, 2006, to the general industry Cr(VI) standard as a result of the Federal settlement agreement with SFIC, as the amendment did not impose additional or more stringent requirements. If the State's standard differs from the Federal, it must either post its standard on its State plan website and provide the link to OSHA or provide a copy to OSHA with information on how the public may obtain a copy. OSHA will provide summary information on the State responses to the Federal Cr(VI) standards and to this Instruction on its website.

**VII. Significant Changes.**

Not applicable.

**VIII. Background.**

The new Chromium (VI) standards, [29 CFR 1910.1026](#), [29 CFR 1926.1126](#), and [29 CFR 1915.1026](#), have lowered the permissible exposure limit (PEL) by a factor of ten to 5 micrograms of Cr(VI) per cubic meter of air ( $5 \mu\text{g}/\text{m}^3$ ) as an 8-hour time-weighted average (TWA). In addition, the standards establish an action level for airborne concentrations of hexavalent chromium at  $2.5 \mu\text{g}/\text{m}^3$ . Prior to the issuance of these three substance-specific standards, enforcement of occupational exposures to hexavalent chromium was based on three general Air Contaminants standards, [29 CFR 1910.1000](#) Air Contaminants, [29 CFR 1915.1000](#) Air Contaminants, and [29 CFR 1926.55](#) Gases, Vapors, Fumes, Dusts, and Mists. Each of these standards formerly listed a PEL for airborne chromic acid and chromates, i.e., various chemical compounds containing hexavalent chromium trioxide or  $\text{CrO}_3$ , and all three standards formerly listed this PEL as  $100 \mu\text{g}/\text{m}^3$  of  $\text{CrO}_3$ , which is chemically equivalent to  $52 \mu\text{g}/\text{m}^3$  of hexavalent chromium. The PEL for chromic acid and chromates in the general industry standard was a ceiling limit, while the PEL in the construction and shipyard standards was an 8-hour TWA. These three Air Contaminants standards also formerly listed a ceiling PEL for airborne tert-Butyl chromate, an organic Cr(VI) compound, as  $100 \mu\text{g}/\text{m}^3$  of  $\text{CrO}_3$ . All these Cr(VI) entries in the Air Contaminants standards have now been changed (by the Final Rule for Hexavalent Chromium) to reference the new applicable Cr(VI) standards, with footnotes to indicate that the formerly listed PELs still apply to any operations or sectors for which the new Cr(VI) standards are stayed or otherwise not in effect. (See [71 FR 10099-10385, Feb. 28, 2006](#), and [71 FR 36008-36010, June 23, 2006](#).)

## IX. Inspection Procedures for the Chromium (VI) Standards.

### A. Scope.

1. Exposure to hexavalent chromium is covered by separate standards, 1910.1026, 1926.1126, and 1915.1026, for general industry, construction, and shipyards, respectively. The standard for shipyards also applies to marine terminals (as per new paragraphs 1917.1(a)(2)(xiii)(E) and (b)) and longshoring (as per new paragraphs 1918.1(b)(9)(v) and (c)). The standards for construction and shipyards are similar to each other, but differ in some respects from the standard for general industry.

The standards apply to occupational exposures to Cr(VI), that is, any chromium species with a valence of positive six ( $\text{Cr}^{+6}$ ), regardless of its form or compound. OSHA considers all Cr(VI) compounds to be carcinogenic. The primary intent of these OSHA standards is to protect employees from lung cancer resulting from inhalation of Cr(VI).

In addition to lung cancer, Cr(VI) is also capable of causing airway sensitization or asthma, nasal ulcerations and septum perforations, skin sensitization or allergic contact dermatitis, irritant contact dermatitis and skin ulcerations, and eye irritation.

For more information on Cr(VI) health effects, see the [Final Rule](#) for the Cr(VI) standards, plus the OSHA website's Safety and Health Topics Page on [Hexavalent Chromium](#), and OSHA's, [Small Entity Compliance Guide for the Hexavalent Chromium Standards](#), OSHA Publication 3320-10N, 2006. See also, the NIOSH website's page on [Hexavalent Chromium](#).

Typical industries/operations with potential Cr(VI) exposures include electroplating, manufacturing of pigments and dyes, welding, foundry operations, spray painting, and paint removal (abrasive blasting, grinding, needle gun, etc.). See [Appendix B](#) for specific examples of Cr(VI) compounds and typical industries/operations with Cr(VI) exposures. As chromium compounds were used in dyes and paints and in the tanning of leather (although hexavalent chromium is no longer typically used in the leather tanning industry), these compounds are often found in soil and groundwater at former or abandoned industrial sites, and may be targeted contaminants for environmental remediation at brownfields and Superfund sites. Primer paint containing hexavalent chromium is still widely used for aerospace and automobile refinishing applications.

Welders represent nearly half of the employees covered by these standards. A welder's exposure to hexavalent chromium may occur from inhalation of fumes when performing "hot work" such as welding, brazing, or torch-cutting stainless steel or other chromium-containing metals. In these

situations the chromium is not originally hexavalent, but the high temperatures involved in the process result in oxidation that converts the chromium to a hexavalent state in the fume. Stainless steels, in general, have 12-30% chromium content.

Eliminating exposures at the source is the most effective method of reducing Cr(VI) exposures. For example, employers with welders may find that switching or modifying welding processes to minimize the generation of hexavalent chromium is the most effective method of reducing Cr(VI) exposures. If it is not practical to change to a different welding process, it may be possible to modify the process to reduce Cr(VI) exposures, such as by installing or improving a local exhaust ventilation system. In some situations, supplemental use of respiratory protection may still be necessary to limit exposures to the PEL. A significant portion of the welders who may need supplemental respiratory protection are working on stainless steel in confined spaces or other similarly enclosed areas, where the use of engineering controls may be limited due to space constraints.

2. There are certain exclusions from these standards. (See [Appendix C](#) of this Directive for more information on these excluded work operations.)
  - a. These standards do not apply to exposures to Cr(VI) in the *application* of pesticides for wood treatment, such as chromated copper arsenate (CCA) and acid copper chromate (ACC). Application of pesticides is instead regulated by the Environmental Protection Agency. These standards do apply where Cr(VI) exposures occur either in the *manufacture* of Cr(VI) pesticides or while *using or otherwise handling* wood products treated with Cr(VI) pesticides. These standards would also apply to employees working adjacent to or inside work areas where Cr(VI) pesticides are being or have recently been applied.
  - b. These standards exclude all exposures to Cr(VI) in portland cement. The Air Contaminants standards already list a PEL for portland cement that effectively limits Cr(VI) exposures from Cr(VI)-contaminated cement to levels below the new Cr(VI) PEL.

Whenever performing an inspection where there *are* exposures to portland cement, such as a construction site, a cement plant, or cinder block manufacturing facility, the compliance officer shall determine the employer's compliance with the applicable existing standards for air contaminants, personal protective equipment, general hygiene, and training.

As part of a settlement to a legal challenge against OSHA's Cr(VI) standard for construction from the Building and Construction Trades Department (BCTD), AFL-CIO, Laborers' International Union of North America, and International Brotherhood of Teamsters, OSHA issued a [Memorandum to its Regional Administrators and State Designees on April 16, 2007](#), directing them to begin using the inspection procedures for portland cement in Appendix C, Section C-1, for all construction site inspections.

- c. These standards do not apply where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI) in 8-hour TWA concentrations at or above  $0.5 \mu\text{g}/\text{m}^3$  under any expected conditions of use. When this provision applies, the material, process, operation, or activity shown not to result in Cr(VI) exposures above the  $0.5 \mu\text{g}/\text{m}^3$  threshold falls outside the scope of the Chromium (VI) standards. This exemption from the scope of the standard is based on *total* Cr(VI) exposures from all sources, and must take into account all conditions that may add or contribute to the employees' overall exposure levels. See [Appendix C](#), Section C-3.

Compliance officers presented with an employer claiming exclusion from the standard on the basis of objective data shall determine sufficiency by evaluating whether the data meet the standard's three key requirements:

- First, the data must demonstrate that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI) in 8-hour TWA concentrations at or above  $0.5 \mu\text{g}/\text{m}^3$  *under any expected conditions of use*.

When using the phrase "any expected conditions of use" OSHA is referring to situations that can reasonably be foreseen. For instance, variation in exposures even in well controlled workplaces requires that typical exposures be below  $0.25 \mu\text{g}/\text{m}^3$  in order for an employer to be reasonably sure that exposures will consistently be below  $0.5 \mu\text{g}/\text{m}^3$ . An industry survey showing typical exposures below  $0.25 \mu\text{g}/\text{m}^3$  might be used to show that exposures for a given operation would be below  $0.5 \mu\text{g}/\text{m}^3$  under any expected conditions of use.

- Second, the data must reflect workplace conditions *closely resembling* the processes, types of material, control methods, work



practices, and environmental conditions in the employer's current operations.

For example, if an employer's objective data indicate that a Cr(VI) welding process that uses argon as an inert shielding gas does not release Cr(VI) in concentrations exceeding  $0.5 \mu\text{g}/\text{m}^3$ , but the compliance officer finds that the employer's current welding process uses carbon dioxide as the shielding gas (which is known to produce far higher amounts of welding fume), then this requirement is not met.

As another example, if an employer's objective data indicate that a process that burns fuel, such as coal, with some specified trace amount of Cr(VI), does not release Cr(VI) in concentrations exceeding  $0.5 \mu\text{g}/\text{m}^3$ , but the data only considered fuel supplied from a specific vendor or from a limited locale, and the compliance officer learns that the employer is currently using fuel obtained from a different vendor or locale, and there is knowledge or reason to suspect the amount of Cr(VI) contamination in this fuel is significantly greater, then this requirement is not met. (See also [Section B.3.c](#) for additional clarification of the phrase "closely resembling.")

- Third, the data must be sufficient to *accurately characterize* employee exposures to Cr(VI), that is, the data must provide the same degree of assurance that employee exposures have been correctly characterized as air monitoring would.

When a compliance officer determines that an employer's objective data meet the above requirements and appear sufficient to support its determination that the facility and/or construction operation is exempt from the Cr(VI) standard, the compliance officer is not required to collect any air samples to confirm the objective data.

If the compliance officer determines that the employer's objective data fail to meet any of the above requirements, then air sampling shall be performed to evaluate Cr(VI) exposures. If air sample results identify Cr(VI) exposures, then the compliance officer shall cite, at a minimum, a violation of (d)(3) because the employer's objective data were not "sufficient to accurately characterize employee exposure to Cr(VI)." Additional violations may be citable, depending on what level of Cr(VI) exposure is found. See [Sections C](#) and [D](#), below, for further inspection and citation guidelines for air sampling and exposure determinations.



- d. As a settlement to a legal challenge against OSHA's general industry Cr(VI) standard from the Surface Finishing Industry Council (SFIC), an agreement was reached on October 25, 2006, which allowed employers with metal-finishing and surface-finishing facilities (i.e., electroplating job shops) to voluntarily accelerate their implementation of engineering controls by 17 months in exchange for relief from enforcement of certain respiratory protection requirements.

OSHA amended the "dates" provisions in paragraph (n) of its final general industry rule on hexavalent chromium to reflect the terms of the settlement (see [71 FR 63238-63245, Oct. 30, 2006](#)).

Eligible employers deciding to opt-in to the SFIC agreement could do so on a facility by facility basis. A total of 27 electroplating facilities within federal OSHA states decided to opt-in to the SFIC settlement agreement (see [Appendix C](#), Section C-3 for a complete [list](#) of these facilities and more information on OSHA's enforcement procedures under the agreement).

## B. Definitions.

1. "Chromium (VI) [hexavalent chromium or Cr(VI)]" means chromium with a valence of positive six, in any form or chemical compound in which it occurs. This term includes Cr(VI) in all states of matter, in any solution or other mixture, even if encapsulated by other substances. The term also includes Cr(VI) created by an industrial process, such as when welding of stainless steel generates Cr(VI) fume. See [Appendix B](#) for examples of Cr(VI) compounds and typical industries/operations with Cr(VI) exposures.
2. All other definitions in the standards are for terms previously used by OSHA in its other health standards, and the terms are similarly defined and used in the new Cr(VI) standards. These terms include "action level," "emergency," "employee exposure," "high-efficiency particulate air (HEPA) filter," "historical monitoring data," "objective data," "regulated area," and "housekeeping." These last two terms, "regulated area," and "housekeeping," are only found in the general industry Cr(VI) standard, as they are not defined or used in the construction or shipyards Cr(VI) standards.
3. For two of the terms listed above, "historical monitoring data" and "objective data," while their definitions are *technically* the same as in other OSHA standards, they have *broader application* in the Cr(VI) standards.

- a. *Historical monitoring data* refers to Cr(VI) monitoring data obtained prior to the effective date of the final rule (May 30, 2006), where the data were obtained during work operations conducted under workplace conditions *closely resembling* the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations, and where that monitoring satisfies all other requirements of the standard, including the accuracy and confidence requirements.
- b. *Objective data* means information such as air monitoring data from industry-wide surveys or calculations based on the composition or chemical and physical properties of a substance demonstrating employee exposure to Cr(VI) associated with a particular product or material or a specific process, operation, or activity. As with historical monitoring data, the objective data must reflect workplace conditions *closely resembling* the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations. Objective data demonstrate the Cr(VI) exposures associated with a work operation or product under the range of expected conditions of use. For example, data collected by a trade association from its members may be used to determine exposures to Cr(VI) provided the data meet the definition of objective data in the standard.

The Cr(VI) standards allow employers to use objective data for two purposes:

- In paragraph (a)(4), *Scope*, to be exempt from all provisions of the Cr(VI) standard if the employer's objective data show that employee exposures are below  $0.5 \mu\text{g}/\text{m}^3$  under any expected conditions of use (note, this is similar to the exemption in the 1,3 Butadiene standard, [29 CFR 1910.1051\(a\)\(2\)\(i\)](#)); or,
  - In paragraph (d)(3), *Exposure Determination*, to determine employee exposures under the *performance-oriented option*, using objective data, historical monitoring data, employee air monitoring data, or any combination thereof. The burden is on the employer to show that the data comply with the requirements.
- c. The term "*closely resembling*" has previously been defined as circumstances where the major workplace conditions which have contributed to the levels of historic exposure are no more protective than in the current workplace. Similarly, in the Cr(VI) standards, OSHA's intent is to allow data reflecting past exposures to be used to predict current exposures only when the conditions of

the earlier job were not more protective, i.e., employees were not better trained, work practices and engineering controls were not used or applied more consistently, and no more supervision was present (see [59 FR 40977](#), 29 CFR Parts 1910, et al., *Occupational Exposure to Asbestos; Final Rule*, August 10, 1994).

C. Permissible Exposure Limit (PEL).

1. Paragraph (c) of the standards establishes an 8-hour TWA permissible exposure limit of  $5 \mu\text{g}/\text{m}^3$ . The new limit applies to Cr(VI), in contrast to the previous PEL, which was measured as CrO<sub>3</sub>.
2. Inspection Guidelines. The OSHA compliance officer shall review the employer's air monitoring records, or other data used by the employer to characterize exposures, to determine what levels might be expected before entering the work area. If review of the employer's air monitoring records shows that overexposures have occurred, then the compliance officer shall document these overexposures by obtaining copies of the employer's exposure data, plus any related attachments or separate documents, such as laboratory analytical results or chain of custody sample forms, and placing them into the case file.
  - a. If the compliance officer believes that the employer's exposure data may not be representative (i.e., new or different operations are occurring in the workplace that do not closely resemble the operations represented by the employer's exposure data), or if there are no exposure data, and operations may be likely to exceed the PEL, the compliance officer shall collect personal samples to measure the 8-hour TWA for one or more of the Cr(VI) operations likely to exceed the PEL. A violation is established if the measured exposure exceeds the PEL after applying corrections for possible sampling and analytical error (SAE) and applying a 95 percent confidence limit (refer to SAE instructions in the OTM, [TED 01-00-015](#)). The compliance officer shall document Cr(VI) exposures by ensuring that all available exposure data – whether provided by the employer or obtained during the inspection – are copied to the case file.

Cr(VI) air sampling procedures may be found through the web page of the OSHA Salt Lake Technical Center (SLTC) under Chemical Sampling Information (CSI). If air samples are not properly handled in accordance with SLTC instructions, then errors may occur due to interferences and/or the high reduction potential of Cr(VI). Unfortunately, there are no colorimetric detector tubes or any other simple devices to quickly and inexpensively screen for

airborne Cr(VI). For conventional air sampling and laboratory analysis, OSHA Analytical Method OSHA ID-215 is specifically designed for hexavalent chromium. This method was revised in April 2006 to improve its accuracy and is listed as [OSHA ID-215 \(version 2\)](#). This method samples air through a 37-mm diameter polyvinyl chloride (PVC) filter (5- $\mu$ m pore size) contained in a polystyrene cassette.

Air samples from chromium electroplating operations should be collected using a binderless quartz fiber filter coated with sodium hydroxide (NaOHqz), and contained in a 37-mm diameter polystyrene cassette. This NaOHqz media is available from SLTC, but it should not be used for sampling any other workplace operation besides plating operations. Alternatively, PVC filters with cellulose back-up pads in polystyrene cassettes can be used to sample chromium plating operations but these samples require special treatment after receipt at the analytical laboratory. For plating operations, the coated quartz fiber filters are preferred over the PVC filters for sample stability.

All air samples, either PVC or NaOHqz filters, are to be collected closed face, then capped, sealed with a Form OSHA-21 label, and shipped overnight to the analytical laboratory within 24 hours of sampling. At least one blank sample shall be submitted with each set of samples, making sure that it is from the same lot as the filters used for sampling. The blank cassette shall be handled in the same manner as the sample cassettes except no air should be drawn through it. Sample volume (in liters of air) shall be recorded for each sample and the type of operation sampled shall be identified. It is important to identify the operation because it affects the sample preparation procedure used at the laboratory.

For any air sampling performed by compliance officers, if they must enter a regulated area or other areas where anticipated exposures are above the PEL or expect to have contact with Cr(VI), they shall wear the personal protective equipment and clothing required by the employer or as appropriate for the officer's inspection or sampling activity. Since compliance officers have no instrumental method for screening airborne concentrations of Cr(VI), they should be conservative about time spent in areas where high concentrations exist or are suspected. Still, when compliance officers are sampling employee exposures, they should frequent the work areas often enough to keep the sampling under surveillance. Also, see [Chapter XIV](#) for specific policies and

precautions to minimize exposures of OSHA personnel.

- b. Since welders represent nearly half of the employees covered by the new Cr(VI) standards, the compliance officer may often have to develop an air sampling strategy for welding operations where Cr(VI) exposures are expected. The compliance officer shall assess the expected contaminants from the operation to be sampled and consider discussing sampling options with an analyst at SLTC. Cr(VI) can be specifically air sampled and analyzed using method OSHA ID-215, as mentioned above.

Welding fumes can be air sampled and analyzed using [OSHA ID-125G](#), however, this method does not distinguish the different valence forms of chromium, such as Cr(VI), in the sampled fume; all forms will simply be identified as chromium metal so the results cannot be used to cite for overexposure to Cr(VI). However, this method is useful in that with one sample it can distinguish multiple metal elements in the fume, such as iron, lead, and aluminum.

For some workplace exposures involving welding, SLTC may advise the compliance officer to collect two samples side-by-side, one for Cr(VI) and one for welding fume. When collecting an air sample on a welder wearing a protective helmet, the sampling cassette shall be positioned inside the helmet. If the free space inside the hood precludes the use of a 37-mm diameter cassette and filter, 25-mm diameter sampling filters and cassettes can be used instead (using OSHA ID-125G and/or OSHA ID-215). In some cases, a welder's helmet may be integrated into a respirator, such as a hooded, powered air purifying respirator (PAPR). If this is the case, the sampling cassette shall be positioned outside the helmet and respirator assembly.

Note: When placing a sampling cassette for monitoring *abrasive blasting* exposures where an employee is wearing an abrasive blast respirator with hood/helmet, the cassette shall be placed outside of the helmet/hood, i.e., outside the abrasive blasting shroud, but as near as practicable to the employee's breathing zone.

If welding exposures are due to multiple maintenance and repair jobs throughout a worksite, and the employee during a typical work shift performs several welding tasks at different locations on different materials under different conditions, then a representative exposure determination is more complex. The employer or compliance officer may choose to perform monitoring by collecting a short-term (grab) sample for each welding task

performed throughout the day, and then adding these measurements to determine the 8-hour TWA exposure ([NIOSH Occupational Exposure Sampling Strategy Manual, 1977](#)).

A compliance officer collecting short-term air samples for Cr(VI) using OSHA ID-215 should run each sample a minimum of 15 minutes, or ideally 30 minutes, nominally at 2 liters per minute for a sample volume of 30 to 60 liters. A volume of 30 liters results in an analytical reporting limit of one-tenth of the PEL, while a 60-liter volume provides a reporting limit of one-twentieth of the PEL.

- c. At times, air sampling for Cr(VI) exposures may involve two or more chemicals with potential health effects to similar target organs, e.g., welding stainless steel, cutting structures coated with lead chromate paint, or cutting pressure-treated wood. If two or more chemical exposures are present potentially causing similar effects to the same target organ(s), samples for both chemicals should be collected.

Thus, if an exposure to a chemical mixture is found that includes Cr(VI) and another toxic chemical, and the substances have known additive effects to one or more target organs, the compliance officer shall apply the mixture formula in [1910.1000\(d\)\(2\)](#), or [1915.1000\(d\)\(2\)](#). (Note that the mixture formula is not in 1926.55.) The procedures in the FIRM, [CPL 02-00-103](#), and the discussion in the OTM, [TED 01-00-015](#), for handling additive effects using the mixture calculation shall be followed.

For further information on operations involving lead chromate, see Chapter X, [Section A.4](#). For further information on operations involving pesticides containing arsenic and Cr(VI), see Chapter X, [Section A.5](#). Compliance officers are instructed to *not* apply the mixture formula in [1910.1000\(d\)\(2\)\(i\)](#), or [1915.1000\(d\)\(2\)\(i\)](#), to mixed exposures of lead and Cr(VI) or to mixed exposures of arsenic and Cr(VI).

- d. If the employer has air monitoring data showing either a Cr(VI) or chromate exposure exceeding the PEL, and the employer was not adequately protecting the employees with all feasible engineering and work practice controls and appropriate use of respiratory protection, but it is not practical for the compliance officer to collect air sample(s) to confirm the overexposure (such as upon arrival on site after Cr(VI) exposures occurred during prior construction operations or non-routine tasks), the employer's data may be used to support a violation of the PEL. That violation shall

be grouped with any violations of applicable exposure control provisions.

- e. If the inspection occurs before the deadline for the implementation of feasible engineering controls of May 31, 2010, and Cr(VI) overexposures are found, the PEL violation shall not be cited as long as exposed employees are provided with appropriate respiratory protection. If overexposures are found, the compliance officer shall investigate whether and when the employer is planning to implement feasible engineering controls. Evidence of the employer's planning and start-up work includes purchased but uninstalled control equipment, engineering system design studies, plans, drawings, purchase orders, and/or initial construction work. (See similar inspection guidelines in [Section F.1.c](#) and [Section N.4.](#))

3. Citation Guidelines. Citations for violations of the PEL shall be issued as follows:

- a. If samples collected on or after May 31, 2010, show that employees are exposed to Cr(VI) over the PEL of  $5 \mu\text{g}/\text{m}^3$ , and if the employer has instituted all feasible work practice and engineering controls and employees are adequately protected by an effective respiratory protection program, then no PEL violation shall be cited. However, if any deficiencies are found the compliance officer shall cite the overexposure as a violation of 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable, plus whatever deficiencies are found in any requirements for engineering and work practice controls or respiratory protection, following the citation procedures for combining and grouping violations in the FIRM, Enforcement and Compliance Directive ([CPL 02-00-103](#)).

When employees are overexposed to both Cr(VI) and any other air contaminant(s), cite each PEL violation, and propose separate penalties on one serious citation. Additionally, where the mixture formula is used and the calculation exceeds unity (i.e., 1.0) but exposures to the individual components do not exceed their PELs, cite only for a violation of 1910.1000(d)(2)(i) or 1915.1000(d)(2)(i). Employers shall control such mixed exposures using feasible administrative or engineering controls, or protective equipment, as per 1910.1000(e).

Where the mixture formula exceeds unity, and one or more components of the mixture also exceed their PELs, cite for



violations of the mixture provision and the PEL(s), and assess separate penalties for each violation on one serious citation, unless the contribution from the smaller component is less than ten percent of that component's PEL.

- b. Until May 31, 2010, if air samples show that employees are exposed to Cr(VI) over the PEL of  $5 \mu\text{g}/\text{m}^3$ , but employees are adequately protected by an effective respiratory protection program, then the PEL violation shall not be cited. However, if there are any deficiencies found in the protective measures instituted, the compliance officer shall cite the overexposure as a violation of 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable, and any violations of respiratory protection requirements following the FIRM's citation procedures for grouping violations.
- c. See [Appendix A](#) for a table and timeline summarizing start-up dates and interim enforcement policies for the Cr(VI) standards.

D. Exposure Determination.

- 1. Paragraphs (d) of the standards require employers to assess their employees' exposures to Cr(VI). The purposes of requiring an assessment of employee exposures to Cr(VI) include: determination of the extent and degree of exposure at the worksite; identification and prevention of employee overexposure; identification of the sources of exposure to Cr(VI); collection of exposure data so that the employer can select the proper control methods to be used; and evaluation of the effectiveness of those selected methods.
- 2. Paragraphs (d)(2) and (d)(3) provide two options for employers to follow in determining employee exposures to Cr(VI). The first option, in paragraph (d)(2), the "scheduled monitoring option," requires initial monitoring and periodic monitoring at specific intervals based on monitoring results. This approach is similar to exposure assessment requirements in previous OSHA substance-specific standards. The second option, in paragraph (d)(3), the "performance-oriented option," allows employers to use any combination of air monitoring data, historical monitoring data, or objective data to determine employee exposures to Cr(VI).
  - a. If initial monitoring measures exposures below the action level of  $2.5 \mu\text{g}/\text{m}^3$ , the employer may discontinue monitoring for employees represented by that initial determination. If exposures are at or above the action level, the employer shall perform



periodic monitoring every six months. If exposures are above the PEL, the employer shall perform periodic monitoring at least every three months.

If periodic monitoring determines that employee exposures drop below the action level, and the result is confirmed by another monitoring at least seven days later, the employer may discontinue the monitoring of employees represented by those determinations.

If there are any changes in the production process, raw materials, equipment, personnel, work practices, or control methods that may be reasonably expected to result in new or additional Cr(VI) exposures, or when the employer has any reason to believe that new or additional exposures have occurred, then the employer shall perform additional exposure monitoring. These additional determinations are necessary to ensure that results accurately represent existing exposure conditions. This information will enable the employer to take appropriate action to protect exposed employees, such as instituting additional engineering controls or providing appropriate respiratory protection.

- b. The performance-oriented option allows the employer to determine the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data, historical monitoring data, or objective data sufficient to accurately characterize Cr(VI) exposures. The employer's exposure determination must provide the same degree of assurance that employee exposures have been correctly characterized as air monitoring would. This option may be useful in certain workplaces, e.g., for Cr(VI) operations that are intermittent, variable, and of short duration, or even for Cr(VI) operations where conditions do not normally change and periodic monitoring would provide little information and no added protection for employees.

Where the employer elects to follow this option, the exposure determination must be performed prior to the time the work operation commences so that the appropriate controls and protective measures can be implemented to ensure employees will not be overexposed. The employer is also expected to reevaluate employee exposures when there is any change in the production process, raw materials, equipment, personnel, work practices, or control methods that may reasonably be expected to result in new or additional exposures to Cr(VI). However, the employer using this option does not have to follow any particular fixed schedule for performing reevaluations.

Unlike previous OSHA substance-specific health standards, the Cr(VI) standards do not limit the use of objective data to show that exposures would be below the action level (e.g., the Cadmium standard, [29 CFR 1910.1027\(d\)\(2\)\(iii\)](#)), nor to historical monitoring data obtained only within the previous 12 months (e.g., the Methylene Chloride standard, [29 CFR 1910.1052\(d\)\(2\)\(ii\)](#)). However, the burden is on the employer to show that the data comply with the requirements of the standard.

For example, historical monitoring data obtained 18 or more months prior to the effective date of the standards could be used to determine employee exposures, but only if the employer is able to demonstrate that the data were obtained during work operations conducted under workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations, and that the monitoring satisfies all other requirements of this standard, including the accuracy and confidence requirements. OSHA's intent is to allow employers flexibility in methods used to determine employee exposures to Cr(VI), but also to ensure that the methods used are accurate in characterizing employee exposures.

If the historical or objective data include air monitoring samples measuring employee exposures to chromates ( $\text{CrO}_3$ ), it may be possible for the employer to derive exposures to hexavalent chromium, since this is the valence (VI) of the chromium metal (Cr) in all chromate compounds. The derivation is made by performing a straightforward calculation on the  $\text{CrO}_3$  analytical result. Simply divide the  $\text{CrO}_3$  result by the ratio of molecular weights (i.e., gravimetric ratio) between  $\text{CrO}_3$  and Cr, or by 1.923.

For example, an employer may have historical or objective air monitoring data that measured exposures while a representative employee painted with a chromate compound. These data were obtained using OSHA Method ID-103 (which has since been superseded by SLTC with OSHA Method ID-215) to sample and analyze for chromates, and the reported analytical result was  $30 \mu\text{g}/\text{m}^3 \text{CrO}_3$ , well below the former PEL of  $100 \mu\text{g}/\text{m}^3$  for chromates in 1910.1000, Table Z-2.

If this employer now uses these same historical or objective air monitoring data as part of the exposure determination under the new Cr(VI) standard, the measured chromate result of  $30 \mu\text{g}/\text{m}^3$  may be used. To do this the original air sampling result must be

converted to an equivalent exposure for hexavalent chromium by dividing the chromate result by 1.923 to derive a Cr(VI) exposure of  $15.6 \mu\text{g}/\text{m}^3$ . This derived exposure now represents a Cr(VI) overexposure compared to the new PEL of  $5 \mu\text{g}/\text{m}^3$  for Cr(VI).

In order to convert any monitoring data in this manner, the employer must ensure that the original sampling and analysis method meets the accuracy requirements of the new Cr(VI) standards (+/- 25%, at a confidence level of 95%, as per paragraph (d)(5) of the standards). OSHA Method ID-103 for chromates meets this accuracy requirement.

In another example, an employer may have historical or objective air monitoring data that measured exposures while a representative employee welded stainless steel on an assembly line. These data were obtained using OSHA Method ID-125G to sample and analyze for welding fumes with a resulting total chromium exposure of  $2 \mu\text{g}/\text{m}^3$ . This total chromium result included all oxides of chromium in the fume with valences of Cr(II), Cr(III) and Cr(VI). However, the different concentrations of these oxides could not be determined by this method, so the employer conservatively assumed that all of the chromium was Cr(VI), as chromium trioxide ( $\text{CrO}_3$ ). If this employer now uses this same sample result for total chromium in welding fumes, as part of an exposure determination under the new Cr(VI) standard, the employer may use the original analytical result for total chromium of  $2 \mu\text{g}/\text{m}^3$  (still representing a worst-case measure of Cr(VI)), which turns out to be below the action level ( $2.5 \mu\text{g}/\text{m}^3$ ) of the new Cr(VI) standards. Because the new Cr(VI) standard is based on chromium and not chromates, an analytical result for chromium does not have to be multiplied by the factor of 1.93 before comparing it with the Cr(VI) PEL.

- c. Inspection Guidelines. If there is any uncertainty regarding employee exposures during an OSHA compliance inspection, the compliance officer shall conduct personal sampling. Refer to the previous guidance on air sampling under [Section A](#), *Scope*, and [Section C](#), *Permissible Exposure Limits*.

The compliance officer shall review the employer's monitoring data or other data used by the employer to characterize Cr(VI) exposures. The compliance officer must determine whether employers have accurately characterized the exposure of each employee to Cr(VI). In cases where the employer uses air monitoring for exposure determinations, this may entail monitoring

of all exposed employees. However, representative exposure sampling is permitted when a number of employees perform essentially the same job under the same conditions. Representative personal sampling for employees engaged in similar work with Cr(VI) exposure of similar duration and magnitude is achieved by monitoring the employee(s) reasonably expected to have the highest Cr(VI) exposures. For example, this may involve monitoring the Cr(VI) exposure of the employee closest to an exposure source. This exposure result may then be attributed to the remaining employees in the group. These samples must include at least one sample characteristic of the entire shift or consecutive representative samples taken over the length of the shift. Where employees are not performing the same job under the same conditions, representative sampling will not adequately characterize actual exposures, and individual monitoring is necessary.

Employers that perform air monitoring must ensure that samples are collected in the employee's breathing zone, i.e., the sampling device is attached to or near the collar or lapel near the employee's face (unless sampling inside a welder's helmet where attachment is made to the helmet). The compliance officer shall review the time periods for the samples collected, and interview employees to determine whether the sample times were representative of the work hours and whether samples were collected in the employee's breathing zone.

The 8-hour TWA exposure is generally best measured by collecting at least one 8-hour air sample from the representative employee, or by collecting two consecutive 4-hour samples. However, there are some situations, e.g., where multiple and different Cr(VI) exposure tasks are performed throughout the work shift, in which it is more effective to collect a short-term (grab) sample during each task (e.g., see the example for maintenance welding in [Section C.2.b](#), above, and for general guidelines see the [NIOSH Occupational Exposure Sampling Strategy Manual, 1977](#)).

Although it is preferable to sample between 7 and 8 hours of exposure, if an employee's Cr(VI) exposure is known to be limited to a small portion of the 8-hour work shift, the employer may determine exposure by sampling only during the exposure period and documenting that there was no additional Cr(VI) exposure during the remainder of the employee's work shift.

Alternatively, for any unsampled exposure time (for example, if 7

hours were sampled and 1 hour was unsampled), the employer may assume the same exposure measured by the sampled period also occurred during the unsampled period.

If the compliance officer determines that the employer's assessment of an employee's full shift exposure is inadequate because of insufficient sampling time and/or insufficient documentation, then a violation of the exposure determination provision shall be cited.

If an air sampling filter becomes overloaded with dusts or other air contaminants while sampling, the result will not be valid. To avoid this situation where high loading of the filter is likely (such as when sampling abrasive blasting or paint grinding operations), the employer should conduct the exposure monitoring using consecutive air samples over shorter sampling periods.

Note: When compliance officers air sample "dusty" operations, such as abrasive blasting, paint grinding, or welding, they should periodically inspect their sampling apparatus. If a sampling pump begins to sound different because of heavy loading of the filter, or if the filter appears fully brown or gray with particulates, then the sampling cassette should be replaced. Such overloading may occur in as short a time as 30 minutes for blasting operations, or within a few hours for some types of welding operations, such as shielded metal arc welding (SMAW or "stick" welding).

Whether an employer used the scheduled monitoring option or the performance-oriented option, the compliance officer shall verify that the employer has performed a new exposure assessment required by (d)(2)(vi) "when there has been any change in production process, raw materials, ... or control methods that may result in new or additional exposures." This provision also requires the employer to make a new exposure assessment when an employee performs a different operation and/or moves to a different work location unless the original determination considered these changes. The original determination can specify production variables over ranges of anticipated operation for which the determination is valid ([\*NIOSH Occupational Exposure Sampling Strategy Manual, 1977\*](#)). One common example of this is an employer's sampling strategy to use an employee whose exposure is "worst case" or "maximum risk," i.e., an employee expected to have the highest Cr(VI) exposures of all employees represented. If the range of changes of differing operations or work locations is not reasonably anticipated to create exposures

higher than the worst-case exposure already determined, then no additional monitoring or exposure determination is required.

- d. Citation Guidelines. If no initial or historic monitoring records exist and the employer does not have objective data (as described in [Section B](#), *Definitions*, above), and employees are exposed to Cr(VI), cite 1910.1026(d)(1), 1915.1026(d)(1), or 1926.1126(d)(1), as applicable.

If the employer is using the scheduled monitoring option, but all samples are area (environmental) samples and not personal samples, or if the employer's personal air samples do not cover the entire Cr(VI)-exposure period or all tasks (without documentation that this is the employee's only exposure to hexavalent chromium), or if the employer's samples are not representative of employees in each work area, (d)(2)(i) shall be cited.

If the employer states that it is using the scheduled monitoring option, but there is no periodic monitoring being performed, (d)(2)(iii) or (d)(2)(iv) shall be cited, as applicable.

If there has been a change in the workplace that could result in new or additional Cr(VI) exposures, and the employer has not performed additional exposure determinations, (d)(2)(vi) shall be cited for employers using the scheduled monitoring option, or (d)(3) shall be cited for employers using the performance-oriented option.

If the employer is using the performance-oriented option and the compliance officer determines that significant differences exist between the historic or objective data and current conditions which could cause the employee(s) exposure(s) to be underestimated (e.g., the data do not meet the criteria in [Section B.3.c](#), above), a violation of (d)(3) shall be cited.

Also, see [Section M](#), Recordkeeping, below, for inspection and citation guidelines concerning the employer's documentation of its exposure determinations.

3. Paragraph (d)(4)(i) of the standards requires employers to notify each affected employee when the exposure determination indicates that employee exposure exceeds the PEL. Note that employees have access to *all* exposure records under [29 CFR 1910.1020](#), Access to Employee Exposure and Medical Records (see paragraph 1910.1020(e)).

Where exposures exceed the PEL, general industry employers shall

provide the notification within 15 working days; construction and shipyard employers shall provide the notification as soon as possible, within 5 working days. Where the employer follows the scheduled monitoring option, the 15 (or 5) working day period commences when monitoring results are received. For employers following the performance-oriented option, the 15 (or 5) working day period commences when the determination is made (i.e., prior to the time the work operation commences or when exposures are reevaluated).

Employers shall perform this notification either by providing a personal written communication to each affected employee, or by posting the written exposure determination results in an accessible area. Affected employees who are not scheduled to work at or be near the posting location must be individually notified in writing of their exposure results.

When using the term “affected employees” in this context, OSHA is referring to all employees whose exposure is considered to be above the PEL. This would include employees who were not actually subject to personal monitoring, but who are represented by an employee who was sampled. Affected employees also include employees whose exposures have been deemed to be above the PEL on the basis of historical or objective data.

Paragraph (d)(4)(ii) of the standards also requires employers to describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL

- a. Inspection Guidelines. The compliance officer shall ask employees whether and when they were given copies of the results of their exposure determination, or when and where the results were posted.
  - b. Citation Guidelines. If employees for whom the employer has documented exposures exceeding the PEL have not seen their exposure determination results within 15 working days for general industry, or within 5 working days for construction or shipyards, and the employer does not have a dated copy of the letter or posting of the results, (d)(4)(i) shall be cited. If the employer’s written notification did not explain corrective action being taken, (d)(4)(ii) shall be cited.
4. Paragraph (d)(5) requires employers to use an accurate sampling and analytical method that has the ability to measure Cr(VI) at the action level with at least the required degree of accuracy (+/- 25%). Rather than specifying a particular method that must be used, OSHA allows any

method to be used, as long as the chosen method meets the accuracy specifications. One example of an acceptable method of monitoring and analysis is OSHA Method ID-215.

NIOSH has developed similar methods, including NIOSH 7600, 7604, 7605, and 7703. These NIOSH methods may meet the accuracy requirements of (d)(5) when adequate sample volumes are collected and the effects of interferences from other metals are controlled. The International Organization for Standardization (ISO) has also developed a method, ISO 16740:2005, for the measurement of airborne hexavalent chromium.

- a. Inspection Guidelines. The compliance officer shall ask the employer for the analytical report(s) of Cr(VI) air monitoring samples. If a method other than an OSHA method has been used, the compliance officer may consult SLTC regarding the accuracy of the other method.
- b. Citation Guidelines. If the laboratory reports indicate that the analytical method does not meet an accuracy of +/- 25% at a confidence level of 95%, then (d)(5) shall be cited.

5. Paragraph (d)(6) provides for observation of monitoring and protection of the observers. This provision is consistent with OSHA's other substance-specific health standards. Note that while this provision requires the employer to provide affected employees or their designated representatives with the right to observe monitoring, the observation should not seriously disrupt production or the sampling itself (see 46 FR 4155-4156).

- a. Inspection Guidelines. The compliance officer shall ask affected employees or their designated representative if they were given the opportunity to observe any monitoring of employee exposure.
- b. Citation Guidelines. If an employee or the employees' designated representative were not given the opportunity to observe monitoring for personal samples, (d)(6) shall be cited.

E. Regulated Areas (not applicable to construction and shipyard standards).

1. Paragraph (e)(1) of the general industry Cr(VI) standard requires employers to establish regulated areas wherever an employee's exposure to airborne concentrations of Cr(VI) is, or can reasonably be expected to be, in excess of the PEL. OSHA is not requiring regulated areas in construction and shipyard workplaces.

- a. OSHA did not require regulated areas in the construction and



shipyard standards for Cr(VI) because of the expected practical difficulties of establishing regulated areas for operations in these sectors. The Agency realizes that in some cases general industry work operations and environments may be comparable to those found in construction and shipyards, and where the general industry employer can show compliance is not feasible, regulated areas will not have to be established.

- b. Inspection and Citation Guidelines. Determine whether the general industry employer is complying with the requirement to conduct all Cr(VI) work within regulated areas wherever an employee's exposure to airborne concentrations of Cr(VI) is, or can reasonably be expected to be, in excess of the PEL. If the employer is not complying and cannot demonstrate infeasibility, 1910.1026(e)(1) shall be cited.

2. The purpose of a regulated area is to ensure that the employer makes employees aware of the presence of Cr(VI) above the PEL, and to limit Cr(VI) exposure to as few employees as possible. The number of persons given access to the area shall be limited to those employees needed to perform the job.

The employer may use any method to demarcate the regulated area as long as it effectively warns employees that they are not to enter unless authorized. The employer may use ropes, markings (such as lines, textured flooring, or warning signs), temporary barricades, gates, or more permanent enclosures to demarcate and limit access to these areas.

- a. Inspection Guidelines. If a general industry employer has established a regulated area, observe the demarcation and persons entering and exiting the area. Determine whether the employer has adequately demarcated a regulated area and whether the demarcation effectively warns employees not to enter unless they are authorized.
- b. Citation Guidelines. If the employer is not complying with the above requirement to demarcate the regulated area, 1910.1026(e)(2) shall be cited.

3. Access to the regulated area shall be limited to persons authorized by the employer and required by work duties to be present in the regulated area. This may include maintenance and repair personnel, management, quality control engineers, or other personnel if job duties require their presence in the regulated area. In addition, persons exercising the right to observe monitoring procedures are allowed to enter regulated areas when exposure

monitoring is being conducted. Persons authorized under the OSH Act, such as OSHA compliance officers, are also allowed access.

- a. Inspection Guidelines. Interview available employees entering and exiting the regulated area to determine if their access is authorized.
- b. Citation Guidelines. If the employer is not complying with the requirement to limit access to authorized persons, 1910.1026(e)(3) shall be cited.

F. Methods of Compliance.

1. Paragraph (f)(1) of the general industry standard and paragraphs (e)(1) of the construction and shipyard standards establish the methods which shall be used by employers to comply with the PEL.
  - a. Paragraph (f)(1)(i) of the general industry standard and paragraph (e)(1)(i) for construction and shipyards require that employers institute effective engineering and work practice controls as the primary means to reduce and maintain employee exposures to Cr(VI) to levels that are at or below the PEL unless the employer can demonstrate that such controls are not feasible. Such controls may not be feasible during some maintenance and repair operations or during emergency operations. Where the employer demonstrates that such controls are not feasible, the standards require the employer to institute engineering and work practice controls to reduce exposures to the lowest feasible level. The employer is then required to supplement these controls with respiratory protection to achieve the PEL.

Engineering controls include process or contaminant substitution, isolation, and ventilation. Work practice controls involve adjustments in the way a Cr(VI) task is performed, such as periodic inspection and maintenance of process and control equipment. If a particular engineering or work practice control not already implemented is feasible, the control shall be identified as an appropriate abatement method.

Paragraph (n)(3) of the general industry standard and paragraph (l)(3) for construction and shipyards require employers to implement engineering controls required by paragraph (f) of the general industry standard and paragraph (e) of the construction and shipyards standards within four years after the new standards' effective date, i.e., no later than May 31, 2010.

During the period in which employers are implementing these controls, respirators shall be used to comply with the new PEL. Employers are encouraged to use feasible engineering and work practice controls as soon as possible, as some controls may be readily implemented well before the four-year deadline, and because respiratory protection is generally less effective at reducing exposures than engineering and work practice controls.

- b. Paragraph (f)(1)(ii) of the general industry standard provides a unique exception for the painting of aircraft or large aircraft parts. For these operations, employee exposures shall be reduced to 25  $\mu\text{g}/\text{m}^3$  or less using engineering and work practice controls. Respiratory protection shall then be used to achieve the PEL. The term “aircraft or large aircraft parts” refers to the interior or exterior of assembled aircraft, and to wings, tail sections, control surfaces (e.g., rudders, elevators, and ailerons), or comparably sized aircraft parts.
- c. Inspection Guidelines. The compliance officer shall observe employees using (or ask the employer to describe and/or demonstrate) the engineering controls and/or work practice controls to ensure that the controls are present and appropriate. If exposures are still over the PEL (or 25  $\mu\text{g}/\text{m}^3$  for aircraft painting), and the employer claims additional engineering or work practice controls are infeasible, the burden is on the employer to support a claim of infeasibility. The employer should provide information specific to the particular operation that is relevant to its claim of infeasibility.

If the inspection occurs before the deadline for implementation of feasible engineering controls, May 31, 2010, and Cr(VI) overexposures are found, the compliance officer shall investigate whether the employer is planning to implement feasible engineering controls. Evidence of the employer’s planning and start-up work includes purchased but uninstalled control equipment, engineering system design studies, plans, drawings, purchase orders, and/or initial construction work.

- d. Citation Guidelines. If the employer’s engineering and work practice controls are not reducing employee exposures to or below the PEL (or 25  $\mu\text{g}/\text{m}^3$  for aircraft painting), and additional engineering and work practice controls are feasible, then (f)(1)(i), or (f)(1)(ii) for aircraft painting, or (e)(1)(i) for construction or shipyards, shall be cited and grouped with the PEL violation, 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable.

If the employer is not planning to implement feasible engineering controls to address Cr(VI) overexposures by the deadline of May 31, 2010, then the compliance officer shall inform the employer of the deadline and discuss the standards' requirements for engineering controls. Prior to May 31, 2010, if feasible engineering controls are not in place for Cr(VI) overexposures and employees are not provided with appropriate respiratory protection, the compliance officer shall cite the overexposure as a violation of 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable, plus whatever deficiencies are found in any requirements for respiratory protection following the citation procedures for combining and grouping violations. A follow-up inspection after the deadline date for engineering controls may be warranted if there is no evidence that the employer is installing or planning to install feasible engineering controls.

- e. Paragraph 1910.1026(f)(1)(iii) of the general industry standard, paragraph 1926.1126(e)(1)(ii) for construction, and paragraph 1915.1026(e)(1)(ii) for shipyards, provide an exception to the general requirement for primary reliance on engineering and work practice controls for processes or tasks that do not result in employee exposures above the PEL for 30 or more days per year (during 12 consecutive months). Thus, if a process or task causes employee exposures to Cr(VI) that exceed the PEL on 29 or fewer days during any 12 consecutive months, the employer is allowed to use any combination of controls, including respirators alone, to achieve the PEL.

This provision is to be narrowly construed to be consistent with OSHA's longstanding preference for engineering controls over respiratory protection. Respirators are less reliable than engineering and work practice controls and create their own safety and health hazards. This provision is intended to cover situations in which Cr(VI) exposures are infrequent and is not meant to permit the use of respirators in lieu of inexpensive, mobile engineering controls.

- f. Identifying Processes and Tasks.
- Welding, Electroplating, and Painting: OSHA considers welding, electroplating, and painting to each constitute a single process or task, i.e., for purposes of determining the applicability of the 30-day exception, the days of exposure above the PEL from all types of welding, or all types of electroplating, or all types of painting, must be considered.

- For job functions other than welding, electroplating, and painting, each other numbered application group identified during the Cr(VI) rulemaking (see, e.g., [71 FR 10265](#)) will typically constitute one process or task. Within each application group, the processes used, exposures generated, and controls needed to achieve compliance will usually be the same. In unusual circumstances, however, an employer may be able to show that a numbered application group actually includes multiple, distinct processes or tasks. These claims must be considered on a case by case basis.
- g. Inspection Guidelines. The burden is on the employer to show that exposures from a process or task do not exceed the PEL on 30 or more days per year.
- The 30-day exception is based on the number of days a process or task results in employee exposures to Cr(VI) that exceed the PEL.
  - The exposures of all employees performing the process or task must be accounted for in determining whether the exception applies. For example, if an employer has a Cr(VI) process that involves exposures above the PEL on 40 days per year, and one employee is exposed for 20 of these days, and a second employee is exposed for the other 20 days, the employer may not claim the 30-day exception based solely on the days either employee is exposed over the PEL. The employer would be required to use feasible engineering and work practice controls for that Cr(VI) process to achieve the PEL since total employee exposures exceed the PEL for 30 or more days per year.
  - When an employer has two or more Cr(VI) processes or tasks within its facility, then exposure days for each process or task are to be considered separately for the purpose of the 30-day exception. The Final Rule’s preamble gives the following example:
 

*“...[A]n employer might have two processes, A and B, where A involves an ongoing process in the facility with exposures above the PEL for 30 or more days and another process, B, that results in exposures above the PEL for 29 or fewer days per year. The fact that the employer has employees exposed above the PEL for more than 30 days in process A will not be used to determine that engineering and work practice controls have to be used for process B.”* (71 FR 10349)

However, employers may not divide or classify a single Cr(VI)

process or task into two or more separate processes or tasks in order to claim the 30-day exception.

Days exceeding the PEL may not be counted as if they result from separate processes or tasks simply because some aspect of the process is changed, such as using a different stock of material. For example, if shop employees are exposed to Cr(VI) in excess of the PEL for 20 days in a 12-month period while electroplating *automotive parts*, and are then exposed to Cr(VI) in excess of the PEL for an additional 20 days while electroplating *plumbing fixtures*, the employer may not designate these two electroplating operations as different processes or tasks for the purpose of the 30-day exception.

In addition, for a *mobile* process or task, such as may be the case with welding or painting, days exceeding the PEL may not be counted as if they result from separate processes or tasks simply because they occur in different locations. For example, if welders at a construction site are exposed to Cr(VI) in excess of the PEL for 20 days, and then relocate to a different work site at a later date where their welding exposures exceed the PEL for an additional 20 days, the employer may not designate these welding activities as different processes or tasks for the purpose of the 30-day exception.

If an employer operates multiple fixed facilities or establishments, and engineering controls for Cr(VI) exposures would need to be permanently fixed in those locations, the days of PEL-exceeding Cr(VI) exposures do not need to be added across facilities. For example, if an employer operates two facilities or establishments – one where a process or task results in exposures over the PEL on 20 days per year, and another one where the same process or task also results in exposures over the PEL on 20 days per year – the employer does not need to install permanent, fixed engineering controls in either location.

- Historical monitoring data and objective data or air monitoring data may be used to demonstrate that a process or task will not result in employee exposures above the PEL for 30 or more days per year. Other information, such as production orders showing that processes involving Cr(VI) exposures are conducted on fewer than 30 days per year, may also be used to demonstrate that employees performing a process or task will not be exposed above the PEL for 30 or more days per year.

If an employer performs exposure determinations to show that whenever a process or task is performed under certain defined conditions the PEL is not exceeded, then any days on which that process or task is performed under those conditions need not be counted for purposes of the 30-day exception. For example, if welders' exposures are determined to be at or below the PEL whenever they use specified low-chromium content materials, then days on which employees are welding only on those low-chromium content materials do not need to be counted as days above the PEL for purposes of the 30-day exception.

The obligation to demonstrate that employees in a process or task will not be exposed above the PEL for 30 or more days per year is the same for general industry, construction, and shipyard employers.

- h. Citation Guidelines. If a process or task results in Cr(VI) exposures above the PEL and engineering and work practice controls are feasible, but respiratory protection is the only control being used, (f)(1)(i) for general industry, or (e)(1)(i) for construction or shipyards, shall be cited unless the employer demonstrates that employees in that process or task are exposed above the PEL for 29 or fewer days per year.
- 2. Paragraph (f)(2) of the general industry standard and paragraphs (e)(2) of the construction and shipyard standards prohibit the rotation of employees to different jobs as a means of achieving the PEL.
  - a. OSHA recognizes that employers rotate employees for a variety of reasons (e.g., an employer may rotate employees in order to provide cross-training on different tasks, or to allow employees to alternate physically demanding tasks with less strenuous activities), and OSHA does not intend for this provision to be interpreted as a general prohibition on employee rotation where there is exposure to Cr(VI).

As an example, an employer is not allowed to use one employee to operate a needle gun for removing Cr(VI) paint from a metal structure for four hours of a work shift, and then rotate the task to a second employee for the last four hours of the work shift just to ensure that each employee's 8-hour TWA exposure does not exceed the Cr(VI) PEL. Yet, if the physical labor for operating a needle gun is so demanding that an employee cannot effectively or safely operate the gun for any more than four hours a day, then employee rotation may be considered a reasonable work practice in

this situation.

- b. Inspection Guidelines. The compliance officer shall interview employees and managers working in and supervising processes or tasks where exposures exceed or are likely to exceed the PEL to determine if employees are rotated to achieve compliance with the PEL.
- c. Citation Guidelines. If the employer cannot demonstrate that an employee's job rotation is conducted for reasons other than compliance with the PEL, (f)(2) for general industry, or (e)(2) for construction or shipyards, shall be cited.

G. Respiratory Protection.

Paragraph (g) of the general industry standard and paragraphs (f) of the construction and shipyard standards establish requirements for respiratory protection.

1. Paragraph (g)(1) of the general industry standard and paragraphs (f)(1) of the construction and shipyard standards require employers to provide employees with appropriate respiratory protection when engineering controls and work practices are not implemented or are not sufficient to reduce employee exposures to or below the Cr(VI) PEL.
  - a. Inspection Guidelines. Specifically, subparagraphs (i)-(v) require employers to provide respirators when:
    - Engineering and work practice controls are being installed (as demonstrated, for example, by an employer's purchase order), as provided by (g)(1)(i) for general industry, or (f)(1)(i) for construction and shipyards; or
    - Engineering and work practice controls are not feasible, such as during maintenance and repair activities, as provided by (g)(1)(ii) for general industry, or (f)(1)(ii) for construction and shipyards; or
    - Engineering and work practice controls are not sufficient to reduce exposure to or below the PEL, as provided by (g)(1)(iii) for general industry, or (f)(1)(iii) for construction and shipyards; or
    - Engineering and work practice controls are not being used because the Cr(VI) process or task is exposing employees for fewer than 30 days per year above the PEL, as demonstrated, for example, by an employer's production order, as provided by (g)(1)(iv) for general



industry, or (f)(1)(iv) for construction and shipyards; or

- An emergency exposes employees to an uncontrolled Cr(VI) exposure, as provided by (g)(1)(v) for general industry, or (f)(1)(v) for construction and shipyards.
  - b. Citation Guidelines. If the employer does not provide appropriate respiratory protection for employees in the above situations, the applicable subparagraph of (f)(1) for general industry or (e)(1) for construction or shipyards shall be cited and grouped with the PEL violation, 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable.
2. Where respirator use is required, paragraph (g)(2) of the general industry standard and paragraphs (f)(2) of the construction and shipyard standards require the employer to institute a respiratory protection program in accordance with OSHA's Respiratory Protection standard ([29 CFR 1910.134](#)).
- a. This provision makes clear to employers covered by the Cr(VI) standards that they must also comply with the Respiratory Protection standard when respirators are provided to employees.
  - b. The Respiratory Protection standard now includes assigned protection factors (APFs) (see [71 FR 50121, August 24, 2006](#)) in a table which shows the level of respiratory protection that a given respirator or class of respirators is expected to provide to properly fitted and trained users when the employer has implemented a continuing, effective respiratory protection program.
  - c. Inspection Guidelines: The compliance officer shall verify that the employer has established and implemented an appropriate respiratory protection program that contains all of the required elements. Compliance with the program shall be verified through a review of the written program, visual observation during a walk-around, and employee interviews.

The compliance officer shall evaluate the adequacy of respiratory protection when the employer requires respirator use and when the employer has made an exposure determination (or the compliance officer has measured an exposure) exceeding the PEL. The assigned protection factor of the respirator shall be high enough to maintain the employee's exposure to Cr(VI) at or below the maximum use concentration (i.e., the product of multiplying the APF of the respirator by the PEL for Cr(VI)). (See [29 CFR](#)

1910.134(d)(3)(i)(B)(1).

The compliance officer shall also review medical examination results that are authorized under the Respiratory Protection standard, 1910.134, and conduct interviews to determine whether there are any employees wearing respirators who should not be. For guidance on inspection procedures for 1910.134, refer to the *Inspection Procedures for the Respiratory Protection Standard, Enforcement and Compliance Directive* ([CPL 02-00-120](#)).

- d. Citation Guidelines: If employees are required to wear respirators, then the employer shall have a respiratory protection program. If the employer has not implemented the program or elements of it are deficient or missing, (g)(2) for general industry or (f)(2) for construction or shipyards shall be cited. Additionally, if elements are deficient or missing, the compliance officer shall group where appropriate and cite the applicable subparagraphs under 1910.134.

For example, when the employer has provided a respirator with an APF that does not maintain an employee's exposure to Cr(VI) at or below the maximum use concentration, (g)(2) for general industry or (f)(2) for construction or shipyards shall be cited and grouped with a violation of 1910.134(d)(3)(i)(B)(1).

If there is a discrepancy between the written program and implemented work practices at the worksite, (g)(2) for general industry or (f)(2) for construction or shipyards shall be cited and grouped with a violation of the paragraph under 1910.134 that requires the work practice.

3. Although the Cr(VI) standards do not address the voluntary use of respirators, where the compliance officer finds employees voluntarily using respirators to protect themselves from Cr(VI) exposures, the applicable provisions of 1910.134 shall be evaluated in accordance with [CPL 02-00-120](#). If violations are found, the applicable voluntary use provisions of 1910.134 shall be cited.

H. Protective Work Clothing and Equipment.

Paragraph (h) of the general industry standard and paragraphs (g) of the construction and shipyard standards set forth requirements for the provision of protective clothing and equipment. The standards require the employer to provide appropriate protective clothing and equipment at no cost to employees where a hazard is present or is likely to be present from skin or eye contact with Cr(VI). Ordinary street clothing and work uniforms or other accessories that do not

protect employees from Cr(VI) hazards are not considered protective clothing or equipment under these standards. Employers are also required to ensure employee use of any clothing and equipment provided.

These requirements are intended to prevent the adverse health effects associated with dermal exposure to Cr(VI) and the potential for inhalation of Cr(VI) that would otherwise be deposited on employees' street clothing. The requirements further serve to minimize exposures to Cr(VI) that may occur as a result of improper handling of contaminated protective clothing or equipment.

1. Paragraph (h)(1) of the general industry standard and paragraphs (g)(1) of the construction and shipyard standards require the employer to provide appropriate protective clothing and equipment where a hazard is present or is likely to be present from skin or eye contact with Cr(VI). To determine whether protective clothing or equipment is necessary, the employer must evaluate the workplace. This performance-oriented requirement is consistent with the general requirements of the Agency's standards for use of PPE in general industry, construction, and shipyards ([29 CFR 1910.132](#), [29 CFR 1926.95](#), and [29 CFR 1915.152](#)).

To determine whether there is a potential hazard from skin or eye contact with Cr(VI) in a workplace, the employer should designate a safety officer or some other qualified person with expertise to assess work activity hazards and select appropriate PPE. (See non-mandatory appendices providing guidance on hazard assessment in [29 CFR 1910 Subpart I Appendix B](#); [29 CFR 1915 Subpart I Appendix A](#)). The recommended approach involves a walk-through survey to identify sources of Cr(VI) hazards to employees. Also recommended are reviews of occupational illness records to determine if skin exposures were reported which may have been linked to Cr(VI) exposures, as well as a review of any exposure determination(s) for operations involving Cr(VI).

OSHA is aware of instances where exposure to Cr(VI) in welding fumes has been associated with development of dermatitis. However, these situations appear to be infrequent, and additional protective clothing and equipment may not generally be required to protect employees from skin contact with Cr(VI) during typical stainless steel welding operations.

Exposures to Cr(VI) in every workplace operation must be evaluated on a case-by-case basis, taking into account the physical aspects of the process or operation and any control measures, the chemical and physical properties of the compound or mixture, and the magnitude and duration of exposure. The employer has flexibility to select the clothing and equipment most suitable for the workplace. Other factors such as size, dexterity, and cut and tear resistance should be considered in the selection

process as well. The point of this performance-oriented requirement is to prevent or eliminate skin exposures to Cr(VI) where feasible, and to reduce the inhalation hazard from Cr(VI) that might otherwise be deposited on employees' street clothing if appropriate protective clothing and equipment were not used.

For example, a chrome plater may require an impervious apron, gloves, and goggles to protect against possible splashes of chromic acid that could result in both Cr(VI) exposure and chemical burns. A painter who works with chromate paints may need gloves, goggles, a respirator, and coveralls. When employees remove contaminated clothing and equipment, there is the potential for exposures to Cr(VI). The standards address this hazard by requiring employers to ensure affected employees use washing facilities (see [Section I](#), *Hygiene Areas and Practices*, below), and that employees know about Cr(VI) hazards (see [Section K](#), *Communication of Chromium (VI) Hazards to Employees*, below). Preventing inhalation of Cr(VI) contamination during removal of clothing and equipment is accomplished by the use of, for example, HEPA vacuuming, cleaning and/or disposal of contaminated clothing and equipment, and personal hygiene.

- a. Inspection Guidelines. The compliance officer shall determine what work operations involve Cr(VI) exposures by examining the employer's exposure determination data, chemical inventories, MSDSs, job hazard analyses, injury/illness/accident data, written medical opinions of employees under medical surveillance, walk-through observations, and conducting employer/employee interviews. Where suspected, a Cr(VI) hazard to the skin or eyes may be confirmed by collecting a wipe or bulk sample for Cr(VI) analysis (see [Section I.4.a](#), below, for specific information on wipe and bulk sampling). A wipe sample, in this case, is collected to determine whether the contaminant (i.e., hexavalent chromium) is, in fact, present; not to measure against any quantitative threshold of dust loading. See the FIRM, [CPL 02-00-103](#), Section 7, Chapter III.

The compliance officer shall assess whether appropriate protective clothing and equipment is being provided by the employer, and at no cost to employees. Although an employer may be providing work uniforms, these may not be "appropriate" protective clothing and equipment if they are not designed to protect the wearer from skin or eye contact with Cr(VI).

- b. Citation Guidelines. Paragraph (h)(1) of the general industry standard, or paragraphs (g)(1) of the construction and shipyard standards, shall be cited if the employer is not providing or

ensuring the use of appropriate protective clothing and equipment where there is a hazard (or likely to be a hazard) from skin or eye contact with Cr(VI), or if the employer is requiring the employees to pay for the protective clothing and equipment. If the employer is requiring the employees to pay for their respirators, then 1910.134(c)(4) shall be cited.

2. Paragraph (h)(2) of the general industry standard and paragraphs (g)(2) of the construction and shipyard standards provide requirements for the removal and storage of protective work clothing and equipment.

a. Paragraph (h)(2)(i) of the general industry standard and paragraph (g)(2)(i) of the construction and shipyard standards require the employer to ensure that employees remove all protective clothing and equipment contaminated with Cr(VI) at the completion of work shifts or tasks involving Cr(VI) exposure, whichever comes first.

For example, if employees perform tasks involving Cr(VI) exposures for the first two hours of a work shift, and then perform tasks that do not involve exposures, they must remove their protective clothing after the exposure period (in this case, the first two hours of the shift). If, however, employees are performing tasks involving Cr(VI) exposure intermittently throughout the day, or if employees are exposed to other contaminants where protective clothing and equipment are needed, this provision does not prevent them from wearing the clothing and equipment until the completion of their shift.

If the employee leaves the contaminated work area for any reason, he or she must first either remove the contaminated clothing and equipment – inside a change room if changing back into street clothes – or remove the Cr(VI) contamination from protective clothing, such as by using a HEPA vacuum, before leaving the work area. This provision limits the duration of employees' exposure, and prevents contamination from Cr(VI) residues on protective clothing reaching other areas of the workplace.

b. Paragraph (h)(2)(ii) of the general industry standard and paragraph (g)(2)(ii) of the construction and shipyard standards require the employer to ensure that Cr(VI)-contaminated protective clothing and equipment is removed from the workplace only by those employees who launder, clean, maintain, or dispose of such clothing or equipment. This provision ensures that clothing contaminated with Cr(VI) is not carried by employees off the

worksite, increasing the employees' exposure as well as exposing other individuals to Cr(VI) hazards.

- c. Paragraph (h)(2)(iii) of the general industry standard and paragraph (g)(2)(iii) of the construction and shipyard standards require the employer to ensure that Cr(VI)-contaminated clothing and equipment that is to be laundered, cleaned, maintained, or disposed of be placed in closed, impermeable containers to minimize contamination of the workplace and ensure that employees who later handle these items are protected.
- d. Paragraph (h)(2)(iv) of the general industry standard and paragraph (g)(2)(iv) of the construction and shipyard standards require the employer to ensure that warning labels are placed on containers of the Cr(VI)-contaminated clothing and equipment so that those subsequently cleaning these items will be informed of and protected from the potential hazards of exposure to Cr(VI), in accordance with the requirements of OSHA's Hazard Communication standard (HCS) ([29 CFR 1910.1200](#)).

The label information is to include the chemical identity, the appropriate hazard warnings, and the employer's name and address. See 1910.1200(f)(1) - (f)(3). An employer who questions whether the two provisions at 1910.1026(j)(3) – that refers employers to HCS – and 1910.1200(f)(4) – that refers employers to a substance-specific health standard – are circular, shall be informed that labeling Cr(VI) containers is to be performed in accordance with 1910.1200(f)(1)-(f)(3).

- e. Inspection Guidelines. Observe and interview employees involved in Cr(VI) operations to determine how, when, and by whom Cr(VI)-contaminated clothing and equipment is removed and cleaned or discarded. If clothing and equipment is disposable, inspect disposal containers for seals and labels. If Cr(VI)-contaminated clothing is laundered and reused and equipment is cleaned, ask the employer how the laundering/cleaning is performed and observe the clothing containers. Also, observe the laundry process, if conducted on-site. Interview employees to see if they have been informed about the requirements for handling Cr(VI)-contaminated clothing and equipment. Also, see the note in [Section IX.H.3.d](#), below concerning employers who provide laundering/cleaning services.
- f. Citation Guidelines. If Cr(VI)-contaminated clothing and equipment are not being removed and disposed of or cleaned

properly, the appropriate subparagraph(s) of (h)(2) for general industry or (g)(2) for construction or shipyards shall be cited. If HCS paragraphs 1910.1200(f)(1)-(3) are cited, they shall be grouped with 1910.1026(h)(2)(iv) for general industry, or (g)(2)(iv) for construction and shipyards.

3. Paragraph (h)(3) of the general industry standard and paragraph (g)(3) of the construction and shipyard standards provide for the cleaning and replacement of the protective work clothing and equipment required by these standards.
  - a. Paragraph (h)(3)(i) of the general industry standard and paragraphs (g)(3)(i) of the construction and shipyard standards require the employer to clean, launder, repair and replace protective clothing as needed to ensure that the effectiveness of the clothing and equipment is maintained. This provision is necessary to ensure that clothing and equipment continue to serve their intended purpose of protecting employees. This also prevents unnecessary exposures outside the workplace.

In keeping with the performance-orientation of the standards, OSHA does not specify how often clothing and equipment must be cleaned, repaired or replaced, because appropriate time intervals may vary widely based on the types of clothing and equipment used, Cr(VI) exposures, and other circumstances in the workplace. The obligation of the employer, as always, is to keep the clothing and equipment in the condition necessary to perform its protective functions.

- b. Paragraph (h)(3)(ii) of the general industry standard and paragraphs (g)(3)(ii) of the construction and shipyard standards prohibit the employer from removing Cr(VI) from protective clothing and equipment by blowing, shaking, or any other means which disperses Cr(VI) into the air. Such actions would result in increased risk to employees from unnecessary exposure to airborne Cr(VI), as well as possible dermal contact.
    - c. Paragraph (h)(3)(iii) of the general industry standard and paragraphs (g)(3)(iii) of the construction and shipyard standards require the employer to inform any person who launders or cleans protective clothing or equipment contaminated with Cr(VI) of the potentially harmful effects of exposure to Cr(VI), and of the need to launder or clean contaminated clothing and equipment in a manner that effectively prevents skin or eye contact with Cr(VI) or the release of airborne Cr(VI) in excess of the PEL. As with the

provision reminding employers of their obligation for labeling under the HCS, this requirement is intended to ensure that persons who clean or launder Cr(VI)-contaminated items are aware of the associated hazards so that they can take appropriate protective measures.

When laundry or cleaning services are performed by third parties, the information transmitted need not be extensive to accomplish this goal. Appropriate hazard warnings, as required on labels by the HCS, will be sufficient to indicate the potentially harmful effects of exposure to Cr(VI). In addition, the language used in this provision, “the clothing and equipment should be laundered or cleaned in a manner that minimizes skin or eye contact with Cr(VI) and effectively prevents the release of airborne Cr(VI) in excess of the PEL,” could be put on a label. The employer is not expected to specify particular work practices that third parties must follow.

- d. Inspection Guidelines. Inspect protective clothing and equipment in Cr(VI) operations for signs of excessive wear or evidence of inadequate cleaning, laundering, and repair. Also inspect stored clothing and equipment for excessive Cr(VI) contamination. Interview the employer and employees to learn the frequency of and methods used for cleaning, laundering, repair, and replacement of protective clothing and equipment.

Note: Any employer providing such laundry services must determine Cr(VI) exposures for their laundry employees, in accordance with paragraph (d) of the Cr(VI) standards, and comply with any other applicable provisions, as well.

- e. Citation Guidelines. If contaminated clothing and equipment are not being adequately or properly cleaned, laundered, repaired, or replaced, or the persons who clean or launder contaminated items were not informed by the employer of the harmful effects of Cr(VI) or of the need to prevent skin or eye contact with Cr(VI) and the release of airborne Cr(VI) above the PEL, then the appropriate subparagraph(s) of (h)(3) for general industry or (g)(3) for construction or shipyards shall be cited.

## I. Hygiene Areas and Practices.

Paragraph (i) of the general industry standard and paragraphs (h) of the construction and shipyard standards require employers to provide hygiene facilities and to assure employee compliance with basic hygiene practices that minimize exposure to Cr(VI). The standards include requirements for change



rooms and washing facilities, ensuring that Cr(VI) exposure in eating and drinking areas is minimized, and prohibit certain practices that may contribute to Cr(VI) exposure.

1. Paragraph (i)(1) of the general industry standard and paragraphs (h)(1) of the construction and shipyard standards restate compliance requirements for OSHA's existing general sanitation provisions, which already address:
  - a. Change rooms - Employers shall provide change rooms in conformance with [1910.141](#) for general industry and shipyards, and [1926.51](#) for construction;
  - b. Washing facilities – Employers shall provide washing facilities in conformance with 1910.141 for general industry, [1915.97](#) for shipyards, and 1926.51 for construction; and,
  - c. Eating and drinking areas – Employers shall provide eating and drinking areas in conformance with 1910.141 for general industry, 1915.97 for shipyards, and 1926.51 for construction.

The hygiene provisions of the Cr(VI) standards are intended to augment the requirements established under these other standards with additional provisions applicable specifically to Cr(VI) exposure.

2. Paragraph (i)(2) of the general industry standard and paragraphs (h)(2) of the construction and shipyard standards require change rooms at all covered workplaces where employees must change their clothes (i.e., take off their street clothes) to use protective clothing and equipment. Where removal of street clothes is not necessary (e.g., in a workplace where only gloves are used as protective clothing), change rooms are not required.
  - a. Inspection Guidelines. Where employees are required to remove street clothing and don protective clothing prior to working with Cr(VI), the compliance officer shall inspect the change room to ensure that it meets the requirements of this paragraph, as well as the requirements in the applicable general Sanitation standards (1910.141 or 1926.51). These general standards require change rooms to be equipped with separate storage facilities for street clothes and protective clothing.
  - b. Citation Guidelines. If a change room is required to control employee exposure to Cr(VI), and the employer has not provided one, or if the employer did not provide separate storage facilities for street clothes and protective clothing, paragraphs 1910.1026(i)(1) and/or (i)(2), shall be cited and grouped with a violation of 1910.141(e) for general industry. For shipyards, 1915.1026(h)(1) and/or (h)(2) shall be cited and grouped with a

violation of 1910.141(e); and for construction, 1926.1126(h)(1) and/or (h)(2) shall be cited and grouped with a violation of 1926.51(i).

3. Paragraph (i)(3) of the general industry standard and paragraphs (h)(3) of the construction and shipyard standards contain requirements for washing facilities. The employer shall provide readily accessible washing facilities capable of removing Cr(VI) from the skin and ensure that affected employees use these facilities when necessary. Also, the employer shall ensure that employees who have skin contact with Cr(VI) wash their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

OSHA expects that hazardous skin and eye exposures will occur infrequently with the proper use of appropriate protective clothing and equipment. For the infrequent occasions when Cr(VI) penetrates protective clothing and equipment, washing facilities are necessary. While actual shower facilities are not required by the Cr(VI) standards, they may be an appropriate industrial hygiene control measure in some situations.

Employers covered by the Cr(VI) standards are already required to provide washing facilities that meet the applicable requirements of 1910.141(d), 1915.97(b), or 1926.51(f). Note that the applicable washing facility requirements of 1926.51(f) for construction are in paragraph 1926.51(f)(1) only.

Where the Cr(VI) standards require employers to provide washing facilities “capable of removing Cr(VI) from the skin,” this means that employers must provide soap and potable water ( OSHA examined scientific data related to whether moist towelettes or other waterless hand cleaners were sufficient for removing harmful contaminants and determined that these cleaners were not adequate substitutes for soap and water).

In addition, where employees are exposed to corrosives or otherwise acute-acting Cr(VI) contaminants (e.g., chromic acid), employers are required to provide facilities for quick drenching or flushing of the eyes and body in accordance with [1910.151\(c\)](#), [1926.50\(g\)](#), or [1917.95\(c\)](#).

- a. Inspection Guidelines. The compliance officer shall interview and, if possible, observe employees who have skin contact with Cr(VI) to see if they wash their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet. If the employer has not provided readily accessible washing facilities, a violation has

occurred. If appropriate washing facilities are available but are not being used, then employee training should be evaluated (see paragraph (l) of the general industry standard, or paragraph (j) of the shipyards or construction standards).

Where exposures to chromic acid or other acute-acting Cr(VI) compounds are identified, the compliance officer shall inspect the work area to determine if facilities are provided for quick drenching or flushing of the eyes and body.

- b. Citation Guidelines. If an employer has not provided readily accessible washing facilities, paragraph 1910.1026(i)(3)(i) shall be cited and grouped with a violation of 1910.141(d) for general industry, or 1915.1026(h)(3)(i) shall be cited and grouped with a violation of 1915.97(b) for shipyards, or 1926.1126(h)(3)(i) shall be cited and grouped with a violation of 1926.51(f)(1) for construction.

If an employer is not ensuring that employees who have skin contact with Cr(VI) are washing their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet, paragraph (i)(3)(ii) for general industry or (h)(3)(ii) for shipyards or construction shall be cited.

If the employer has workplace exposures to chromic acid or other acute-acting Cr(VI) compounds but has not provided suitable facilities for quick drenching of the eyes and body for employees, 1910.1026(i)(3)(i) shall be cited and grouped with a violation of 1910.151(c) for general industry, or 1915.1026(h)(3)(i) shall be cited and grouped with a violation of 1917.95(c) for marine terminals, or 1926.1126(h)(3)(i) shall be cited and grouped with a violation of 1926.50(g) for construction.

4. The employer is not required to provide eating and drinking facilities to employees. However, if an employer allows employees to eat at the worksite, paragraph (i)(4) of the general industry standard and paragraphs (h)(4) of the construction and shipyard standards, require the employer to ensure that eating and drinking areas and surfaces are maintained as free as practicable of Cr(VI). Employers also are required to ensure that employees do not enter eating or drinking areas wearing protective clothing, unless the protective clothing is properly cleaned beforehand. Employers may use any method for removing surface Cr(VI) from clothing and equipment that does not disperse the dust into the air or onto the employee's body. For example, if an employee is wearing coveralls for

protection against Cr(VI), thorough HEPA vacuuming of the coveralls could be performed prior to entry into a lunchroom.

- a. Inspection Guidelines. When employees eat and drink at the worksite, there are often cafeterias or break rooms. Employees may not eat or drink in Cr(VI)-contaminated work areas. Any area used by employees for eating or drinking shall be maintained as free as practicable from Cr(VI).

The compliance officer shall observe where employees consume food and beverages, and how employees handle their protective work clothing and equipment before entering eating and drinking areas.

When a determination has been made that an employer could reduce Cr(VI) contamination of surfaces within eating and drinking areas, or could make another area that is not contaminated available for employee consumption of food and drink, the compliance officer shall collect wipe or bulk samples to provide evidence that the surface contamination is Cr(VI). The standards do not define the term, “as free as practicable,” however, if a wipe sample confirms Cr(VI) surface contamination in an area used for eating and drinking, and the compliance officer determines that the employer has not taken practicable measures to make a clean area available for eating and drinking, the employer is not in compliance with this provision.

For wipe samples, carefully wipe all removable dust from the surface being tested within an area of approximately 100 cm<sup>2</sup>. Carefully fold the wipe sample with the exposed side in, and then place the folded wipe inside a 20-ml vial. Depending on the media selected, the sample vials may need to be pre-loaded by the laboratory with extraction reagent. If wipe samples are not pretreated or not immediately digested with prescribed buffering solutions, then significant errors may occur due to interferences and the high reduction potential of Cr(VI). Complete wipe sampling procedures may be found through the SLTC CSI. [OSHA Analytical Method W4001](#) is specifically designed for wipe sampling and analysis for hexavalent chromium. OSHA W4001 essentially duplicated those elements within OSHA ID-215 (June, 1998) that were specific for wipe sampling.

A direct-read wipe for real-time detection or screening of surface chemicals can be useful in showing the areas and amounts of hexavalent chromium contamination. A few manufacturers have

developed these wipes for on-the-spot detection of dozens of chemicals, including hexavalent chromium, beryllium, cadmium, lead, and mercury. The compliance officer should check with OSHA's Cincinnati Technical Center (CTC) for available supplies, and contact the SLTC to discuss the limitations (interferences, limits of detection, etc.) on using these wipes to screen for surface contamination.

Bulk samples may be collected for a variety of reasons, such as to determine the presence of Cr(VI) in paint removed by abrasive blasting, to determine the presence of Cr(VI) in waste or debris, or to confirm a suspicion that a product's material safety data sheet is not accurate concerning the presence of a Cr(VI)-containing ingredient. Bulk samples shall be shipped to the analytical laboratory separately from wipe or air samples. Cr(VI) bulk sampling procedures may be found within the original method [OSHA ID-215 \(June, 1998\)](#), which is still posted on the OSHA website because the bulk sampling procedures were not included within the revised method OSHA ID-215 (April, 2006).

Wipe and bulk samples collected for laboratory analysis are to be placed in 20-ml glass scintillation vials or other appropriate sized glass vial with polytetrafluoroethylene (PTFE) lined caps, one for each sample. Bulk solid samples should be approximately 20 grams in weight. Bulk liquid samples should be approximately 20 milliliters in volume. Note that quantities are approximate, so bulk or liquid samples placed in 20-ml glass vials do not need to be filled to the brim.

Whenever handling Cr(VI) materials, such as when collecting wipe or bulk samples, compliance officers shall wear protective gloves. For many Cr(VI) compounds, nitrile or polyvinyl chloride (PVC) gloves will provide sufficient protection, but it is suggested to first check the MSDS for the compound, if available, or check the glove manufacturer's performance specifications. Do not wear powdered gloves. Additionally, if 1% NaOH-coated, binderless quartz fiber filters are used for wipe sampling, gloves must provide sufficient protection from the caustic NaOH coatings on the filters.

- b. Citation Guidelines. If an area for employee consumption of food or beverages is not maintained as free as practicable of Cr(VI) contamination, paragraph (i)(4)(i) for general industry or paragraph (h)(4)(i) for shipyards or construction shall be cited.

If employees are observed entering areas for eating and drinking

without first removing their protective clothing and equipment, or at least removing Cr(VI) surface contamination from their protective clothing and equipment, or if they may potentially disperse Cr(VI) contamination into the air in a manner that exposes an employee's body to the Cr(VI) contamination, paragraph (i)(4)(ii) for general industry or paragraph (h)(4)(ii) for shipyards or construction shall be cited.

5. Paragraph (i)(5) of the general industry standard and paragraphs (h)(5) of the construction and shipyard standards prohibit eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics in regulated areas or in areas where skin or eye contact with Cr(VI) occurs. Products associated with these activities, such as food and beverages, cannot be carried or stored in these areas. Because the construction and shipyard standards do not include requirements for regulated areas, reference to regulated areas is omitted in the regulatory text for these standards.
  - a. Inspection Guidelines. If the compliance officer observes or receives reports of any prohibited activities (eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or storing such products) in a work area where skin or eye contact with Cr(VI) occurs, or within a Cr(VI) regulated area, air, wipe, and/or bulk samples shall be collected to document exposures to Cr(VI).
  - b. Citation Guidelines. If employees are permitted to conduct any of these prohibited activities (eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or carrying or storing related products) in regulated areas, or in areas where skin or eye contact with Cr(VI) occurs, as confirmed by the compliance officer's positive sample(s) for Cr(VI), paragraph (i)(5) of the general industry standard or (h)(5) for shipyards or construction shall be cited.

J. Housekeeping (not applicable to construction and shipyard standards).

The general industry standard includes housekeeping provisions that require employers to maintain surfaces as free as practicable of Cr(VI), promptly clean Cr(VI) spills and leaks, use appropriate cleaning methods, and properly dispose of Cr(VI)-contaminated waste.

OSHA has determined that housekeeping requirements are highly impracticable for control of Cr(VI) exposures in construction and shipyard workplaces and, therefore, has not included housekeeping requirements for these industry sectors. Construction and shipyard employers still need to comply with the general housekeeping requirements found in [29 CFR 1926.25](#) (for construction), in [29](#)

[CFR 1915.91](#) (for shipyards), in [29 CFR 1917.11](#) (for marine terminals), and in [29 CFR 1918.91](#) (for longshoring).

The Agency recognizes that in some cases general industry work operations and work environments may be comparable to those found in construction and shipyards, i.e., are short in duration; performed outdoors, potentially under adverse environmental conditions (e.g., wind, rain); and are done at non-fixed workstations or worksites. As paragraph (j)(1)(i) of the standard only requires surfaces to be maintained as free of the accumulation of Cr(VI) “as practicable,” it provides flexibility for any general industry situations where, as in construction and shipyards, it is not practicable to implement the housekeeping provisions.

1. Paragraph (j)(1) requires the general industry employer to ensure that all surfaces are maintained as free as practicable of accumulations of Cr(VI), and that all spills and releases of Cr(VI)-containing material are cleaned up promptly.

a. Inspection Guidelines. The compliance officer shall observe where employees perform operations involving Cr(VI) exposures to make a visual assessment of housekeeping practices. Where suspected, poor housekeeping shall be further assessed by collecting a wipe or bulk sample for Cr(VI) analysis. Refer to the inspection guidelines for wipe and bulk sampling, above, in [Section I.4.a](#). Employers and employees shall be interviewed and mishap reports, if available, shall be reviewed for incidents of spills and releases of Cr(VI) materials. Injury/illness records shall be checked for reports of skin exposures to Cr(VI) that could have been caused by poor housekeeping practices or improper spill response.

The standard does not provide a maximum allowable surface loading of Cr(VI) contamination in work areas as a criterion for “as free as practicable.” However, if a wipe sample does confirm Cr(VI) surface contamination in a work area, and the compliance officer determines that the employer has not taken practicable measures to reduce the Cr(VI) contamination, then the employer is not in compliance with this provision.

b. Citation Guidelines. If general industry employers do not ensure that workplace surfaces are maintained as free as practicable of Cr(VI), paragraph (j)(1)(i) shall be cited. Spills or releases of Cr(VI) that are not cleaned up promptly shall be cited under paragraph (j)(1)(ii).

2. Paragraph (j)(2) requires cleaning methods that best capture Cr(VI)-containing material, including HEPA-filtered vacuuming or other methods



(such as wet methods) that minimize Cr(VI) exposure. If preferred cleaning methods such as HEPA-filtered vacuuming or wet methods have been tried, but are not effective, then the employer may use dry shoveling, sweeping, or brushing, or compressed air in conjunction with a ventilation system designed to capture the dust cloud. Compressed air may be used without a ventilation system to capture dust only if no alternative method is feasible, such as cleaning out-of-reach crevices within furnaces, but these circumstances are expected to be extremely rare. Caution should be exercised whenever compressed air is used as a cleaning method, since the air will spread the contamination further unless the dust is appropriately collected. Additionally, some airborne dusts may be explosive<sup>†</sup> at high concentrations and may settle inside electric motors or other electric equipment and become an ignition source. Caution should also be exercised to avoid directing compressed air at employees; compressed air should not be used to clean protective clothing or equipment that employees are wearing. General industry employers shall ensure that all cleaning equipment is handled to minimize reentry of Cr(VI) into the workplace.

<sup>†</sup>Note: The combustible properties of dusts depend on their composition, among other factors, including concentration, confinement, oxygen and ignition. Fly ash that may contain trace amounts of Cr(VI) is not combustible since it is, itself, a byproduct of combustion. Solid chromium trioxide (CrO<sub>3</sub>), which may be in the form of a dark red powder, is noncombustible but it will accelerate the burning of combustible materials ([NIOSH Pocket Guide to Chemical Hazards](#) and OSHA Safety and Health Information Bulletin 07-31-2005, *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions*). Compliance officers finding a workplace with combustible dusts shall also refer to OSHA Instruction [CPL 03-00-006](#), *Combustible Dust National Emphasis Program*.

- a. Inspection Guidelines. The compliance officer shall interview and/or observe employees who are cleaning Cr(VI)-containing materials to inspect for approved methods. The compliance officer shall also observe the handling of cleaning equipment, such as HEPA-filtered vacuums. Maintenance operations to clean and/or replace vacuum filters also require effective housekeeping methods, such as using a second HEPA-filtered vacuum and a drop cloth to collect releases of Cr(VI)-contaminated dust.
- b. Citation Guidelines. If general industry employers do not ensure that cleaning methods, such as HEPA-filtered vacuuming, are used to minimize the likelihood of exposure to Cr(VI), paragraph (j)(2)(i) shall be cited. If an employer uses dry shoveling,



sweeping, or brushing without demonstrating that HEPA-filtered vacuuming or similar cleaning methods that minimize Cr(VI) exposures were tried and found to be ineffective, paragraph (j)(2)(ii) shall be cited. If employers are allowing employees to use compressed air to remove Cr(VI) from surfaces without a ventilation system to capture the blown dust and without demonstrating that no alternative method is available, paragraph (j)(2)(iii) shall be cited. If employers are not ensuring that cleaning equipment is handled in a manner that minimizes the reentry of Cr(VI) into the workplace, (j)(2)(iv) shall be cited.

3. Paragraph (j)(3) requires that general industry employers use proper containers and labels in accordance with the HCS to dispose of waste, scrap, debris, and other waste products contaminated with Cr(VI). The containers are to be sealed in impermeable bags or other impermeable containers. The label information is to include the chemical identity, the appropriate hazard warnings, and the employer's name and address.

OSHA intends for the waste disposal provisions to be performance-oriented. The standard permits the use of any container so long as it prevents release of or contact with Cr(VI). For example, sealed barrels could be used to serve this purpose. Palletizing items and wrapping the pallet in plastic to create an impermeable barrier between workers and the Cr(VI)-contaminated waste, scrap or debris would also be acceptable.

The corresponding provisions in the HCS for labeling Cr(VI) wastes are [1910.1200\(f\)\(1\)-\(f\)\(3\)](#). The labeling of Cr(VI) wastes is to be performed in accordance with [1910.1200\(f\)\(1\)-\(f\)\(3\)](#), despite language in [1910.1200\(f\)\(4\)](#) referring employers to a substance-specific health standard.

In the event of an inquiry, the employer shall be informed that "hazardous waste" under the EPA's Resource Conservation and Recovery Act (RCRA) is specifically exempted from the HCS by subparagraph [1910.1200\(b\)\(6\)\(i\)](#). OSHA recognizes that the RCRA's labeling requirements adequately convey hazard information to affected employees. RCRA is further described in [Chapter X, Section B.1.b](#).

- a. Inspection Guidelines. The compliance officer shall observe disposal practices to ensure that employers are using sealed, impermeable bags or other closed, impermeable containers labeled in accordance with the Hazard Communication standard, 29 CFR [1910.1200\(f\)\(1\)-\(f\)\(3\)](#).
- b. Citation Guidelines. If general industry employers do not ensure

that Cr(VI) disposal containers are sealed and impermeable, paragraph (j)(3)(i) shall be cited. If disposal containers are not properly labeled to warn employees of hazardous Cr(VI) material, paragraph (j)(3)(ii) shall be cited. If HCS paragraphs 1910.1200(f)(1)-(3) are cited, they shall be grouped with 1910.1026(j)(3)(ii).

K. Medical Surveillance.

Paragraph (k) of the general industry standard and paragraphs (i) of the construction and shipyard standards set forth requirements for the provision of medical surveillance.

1. Paragraph (k)(1) of the general industry standard and paragraphs (i)(1) for construction and shipyard standards require employers to make medical surveillance available at no cost, and at a reasonable time and place. If participation requires travel away from the worksite, the employer must bear the cost. Employees must be paid for time spent taking medical examinations, including travel time.

In the standards, OSHA requires that medical surveillance be provided to employees who are experiencing signs or symptoms of the adverse health effects associated with Cr(VI) exposure, or who are exposed in an emergency. In addition, OSHA requires employers to provide medical surveillance for all employees exposed to Cr(VI) at or above the action level for 30 or more days a year.

- a. OSHA intends that employees be trained about the signs and symptoms of Cr(VI)-related adverse health effects. This information, in conjunction with the training on Cr(VI) hazards required by the HCS, will help to assure that employees are able to adequately report signs and symptoms of Cr(VI)-related adverse health effects in order to receive medical attention from a licensed health care professional.
- b. Medical surveillance shall be made available to employees exposed in an emergency regardless of the airborne concentrations of Cr(VI) normally found in the workplace. While there are chronic effects associated with Cr(VI) exposure, there are also short-term effects such as skin ulcerations and dermatitis that might result from high exposures occurring during an emergency.
- c. The use of 30 days of exposure at or above the action level as a trigger for medical surveillance addresses potential Cr(VI) health effects associated with repeated exposures.

Even in situations where the employer elects the performance-oriented option for exposure determinations, OSHA requires that the employer sufficiently characterize all employee exposures to determine when to provide routine medical surveillance.

- d. Employers with temporary employees who are exposed to Cr(VI) during their employment, but who are employed for fewer than 30 days, must still provide medical surveillance if those employees experience signs or symptoms of the adverse health effects associated with Cr(VI) exposure or are exposed to Cr(VI) in an emergency.
  - e. Medical surveillance must be performed by or under the supervision of a physician or other licensed healthcare professional (PLHCP). Any health care professional can conduct medical examinations and procedures provided for under the standards if they are permitted by state law to do so. If an unlicensed person performs the medical examination under the supervision of a licensed physician or health care provider, he or she may write the medical opinion, but the licensed provider must review, concur with, and assume responsibility for the opinion. Any signature on the opinion must be the licensed provider's signature .
2. Paragraph (k)(2) of the general industry standard and paragraphs (i)(2) of the construction and shipyard standards require employers to provide all covered employees with medical examinations whenever an employee shows signs or symptoms of Cr(VI) exposure, within 30 days after an emergency resulting in an uncontrolled release of Cr(VI), and within 30 days after a PLHCP's written medical opinion recommends an additional examination. In addition, employers are required to provide covered employees with examinations within 30 days after initial assignment (unless the employee has received a medical examination in accordance with the standards within the past 12 months), annually, and at the termination of employment (unless an examination has been given less than six months prior to the date of termination).

Although the provision requiring medical examinations whenever an employee shows signs or symptoms of Cr(VI) exposure does not specify a specific number of days within which the employee must have the exam, employers must make examinations available for injured or ill employees as soon as possible so that prompt treatment is provided.

When an employer has previously determined that employees' exposures are at or above the action level for fewer than 30 days per year, but a change in process or task occurs that results in 30 or more days of

exposure above the action level, then medical surveillance shall be made available to these employees. In such cases, the employer must make a reasonable attempt to provide a medical examination by the 30th day of exposure.

Note: For employees working in operations covered by [29 CFR 1910.124](#), *General Requirements for Dipping and Coating Operations*, or [29 CFR 1926.57](#) *Ventilation*, Section (i), *Open Surface Tanks*, those standards' provisions for periodic medical examination apply even if employees would not need an examination under the Cr(VI) standards. For example, 1910.124(h)(4) and 1926.57(i)(9)(viii), require the employer to provide periodic examinations of exposed body parts, especially nostrils, to employees exposed to chromic acid in electroplating, whether or not the employees are exposed above the Cr(VI) action level for 30 or more days a year. (See Chapter X, *Interface with Other Standards*, [Section A.3.](#))

3. Paragraph (k)(3) of the general industry standard and paragraphs (i)(3) of the construction and shipyard standards specify that the examination by the PLHCP shall consist of a medical and work history, a physical examination of the skin and respiratory tract, and any additional tests considered appropriate by the PLHCP. While additional tests, such as baseline and periodic spirometry and baseline chest x-rays, may be considered appropriate for certain affected employees, such determinations are left to the discretion of the PLHCP. Special emphasis is to be placed on the employee's medical and work history related to Cr(VI) exposure, health effects associated with Cr(VI) exposure, and smoking.
4. Paragraph (k)(4) of the general industry standard and paragraphs (i)(4) of the construction and shipyard standards require the employer to ensure that the PLHCP has a copy of the standard, and to provide the PLHCP with a description of the affected employee's former and current duties as they relate to Cr(VI) exposure; the employee's former, current, and anticipated exposure levels; a description of any personal protective equipment used or to be used by the employee, including when and for how long the employee has used that equipment; and information from records of employment-related medical examinations previously provided to the affected employee that are currently within the employer's control.
5. Paragraph (k)(5) of the general industry standard and paragraphs (i)(5) of the construction and shipyard standards require employers to obtain from the examining PLHCP a written opinion containing the results of the medical examination with regard to Cr(VI) exposure, the PLHCP's opinion as to whether the employee would be placed at increased risk of material health impairment as a result of exposure to Cr(VI), and any recommended limitations on the employee's exposure or use of personal

protective equipment. The PLHCP must also state in the written opinion that these findings were explained to the employee.

- a. Under the standards, the PLHCP may not include findings or diagnoses that are unrelated to Cr(VI) exposure in the written opinion provided to the employer.
- b. The employer shall obtain the written opinion within 30 days of the examination and must provide a copy of the written opinion to the employee within two weeks of receiving it, to ensure that the employee is informed of the opinion in a timely manner. If a PHLCP is also providing the employer with written opinions related to other OSHA-regulated substances, the PHLCP can issue a single written opinion addressing all covered substances to which an employee is exposed.

6. Inspection Guidelines. The compliance officer shall make sure that the employer has included the appropriate employees in the medical surveillance program. Employers with dipping and coating operations also covered under 1910.124 or 1926.57 must make *periodic* examinations available to employees working with chromic acid regardless of the level of exposure, in accordance with those standards. The compliance officer shall ask selected employees if they were offered medical examinations by their employer. Although OSHA's health standards require employers to provide employees an opportunity for medical examinations, employees are not required to take them. Employers should continue to offer a medical examination to each authorized employee whenever it comes due again, even if the employee has previously refused such an examination.

Where employees have been evaluated by a health care provider, the compliance officer shall ask employees if the evaluation took place prior to or within 30 days of beginning their Cr(VI) work assignments. Employees shall be interviewed to determine if the employer is requiring employees to pay for the examinations or to undergo medical testing at unreasonable times or places.

Health care providers may also be contacted to determine whether the appropriate information was provided by the employer.

The compliance officer may need to ask the employer for copies of the written medical opinions. Whenever reviewing medical opinions, the compliance officer shall follow OSHA Instruction [CPL 02-02-072](#), *Rules of Agency Practice and Procedure Concerning OSHA Access to Employee Medical Records*. Since records are often kept at contractors' main offices, a compliance officer will likely not be able to verify content of the

written opinion on a construction job site. The compliance officer shall ask some of the employees if they have received a copy of the physician's written opinion.

7. Citation Guidelines. If Cr(VI) medical surveillance from a PLHCP was not made available by general industry employers to their employees in accordance with the exposure criteria of (k)(1) and the frequency requirements of (k)(2), or (i)(1) and (i)(2), respectively, for construction or shipyards, the appropriate subparagraph(s) shall be cited. For example, if no medical surveillance was provided when general industry employees were exposed at or above the action level for 30 or more days a year, 1910.1026(k)(1)(i)(A) shall be cited. (Have monitoring data to support the citation.) Or if employees told their employer that they were experiencing signs or symptoms of Cr(VI) exposure, and the employer did not make medical surveillance available at that time, (k)(2)(iv) for general industry or (i)(2)(iv) for construction or shipyards shall be cited.

If annual or other periodic medical surveillance was not made available to general industry or construction employees performing dipping and coating operations involving Cr(VI) exposures, but the employer demonstrated that exposures were not above the action level on 30 or more days per year, 1910.124(h)(4) or 1926.57(i)(9)(viii) shall be cited, respectively. (See Chapter X, *Interface with Other Standards*, [Section A.3.](#))

Paragraph (k)(3) of the general industry Cr(VI) standard, or (i)(3) of the construction or shipyard standards, or applicable subparagraphs, shall be cited if the medical examinations did not include the required element(s).

Paragraph (k)(4) of the general industry standard or (i)(4) of the construction or shipyard standards shall be cited if the examining PLHCP was not provided the required information by the employer. The appropriate subparagraph shall be cited for the elements not provided, i.e., (k)(4)(i)-(iv) for general industry or (i)(4)(i)-(iv) for construction or shipyards.

If there is no written opinion, (k)(5)(i) for general industry, or (i)(5)(i) for construction or shipyards shall be cited. If employees remember seeing the written opinion, but the employer cannot find it, the recordkeeping provision, (m)(4)(iii) for general industry or (l)(4)(iii) for construction or shipyards shall be cited. If employees were not given a copy of the written opinion, (k)(5)(iii) for general industry or (i)(5)(iii) for construction or shipyards shall be cited. Citations shall be issued only when it can be established that two or more employees did not receive a copy.

L. Communication of Chromium (VI) Hazards to Employees.

Paragraph (l) of the general industry standard and paragraphs (j) of the construction and shipyard standards set forth requirements intended to ensure that the dangers of Cr(VI) exposure are communicated to employees. The hazard communication requirements of these standards complement existing requirements of OSHA's Hazard Communication standard (HCS) ([29 CFR 1910.1200](#)), which covers employees exposed to airborne Cr(VI) or who have skin or eye contact with Cr(VI).

Paragraph (e)(1) of the HCS requires employers to develop and implement a written hazard communication program that provides for employee training, and paragraph (h)(1) requires employers to provide that training at the time of initial assignment.

1. Paragraph (l)(1) of the general industry Cr(VI) standard and paragraphs (j)(1) of the construction and shipyard standards make clear that the hazard communication requirements of these standards are in addition to those required by the HCS. Paragraphs 1910.1200(h)(2)(ii) and (h)(3)(ii-iii) of the HCS already require employers to provide Cr(VI)-exposed employees with training on the following:
  - a. Health hazards associated with Cr(VI) exposure;
  - b. The location, manner of use and release of Cr(VI);
  - c. Engineering controls and work practices associated with the employee's job assignment;
  - d. The purpose, selection and use of respirators and protective clothing;
  - e. Emergency procedures; and,
  - f. Measures employees can take to protect themselves.
2. Paragraph (l)(2) of the general industry Cr(VI) standard and paragraphs (j)(2) of the construction and shipyard standards list three additional requirements:
  - a. The employer shall ensure that each employee can demonstrate knowledge of the contents of the Cr(VI) standard;
  - b. The employer shall ensure that each employee can demonstrate knowledge of the purpose and description of the medical surveillance program required under the Cr(VI) standard; and,
  - c. The employer shall make a copy of the Cr(VI) standard readily available to employees without cost.

Whether an employee can “demonstrate knowledge” requires professional judgment based on answers given during an employee interview. Employees should know that Cr(VI) is hazardous, where and how it is used and controlled in the workplace, the signs and symptoms of exposure, and that medical examinations are to be made available under certain conditions.

3. Inspection Guidelines. The compliance officer shall review the employer’s written hazard communication program to determine whether it includes information and training on Cr(VI) hazards and control measures. The compliance officer shall question affected employees to see if they have ever had training on the Cr(VI) standard, if they understand the Cr(VI) medical surveillance program, and if a copy of the Cr(VI) standard was made available to them.
4. Citation Guidelines. When affected employees received no Cr(VI) information or training, (l)(1) and (l)(2) for general industry or (j)(1) and (j)(2) for construction or shipyards shall be cited. If HCS paragraphs 1910.1200(h)(2)(ii) and (h)(3)(ii-iii) are cited, they shall be grouped with 1910.1026(l)(1) for general industry, 1915.1026(j)(1) for shipyards, or 1926.1126(j)(1) for construction. When employees cannot demonstrate knowledge of the contents of the Cr(VI) standard and the Cr(VI) medical surveillance program, (l)(2)(i) for general industry or (j)(2)(i) for construction or shipyards shall be cited. If the employer did not make a copy of the Cr(VI) standard readily available to affected employees without cost, (l)(2)(ii) for general industry or (j)(2)(ii) for construction or shipyards shall be cited.

M. Recordkeeping.

Paragraph (m) of the general industry standard and paragraphs (k) of the construction and shipyard standards require employers to maintain exposure and medical surveillance records. The recordkeeping provisions of these standards are consistent with OSHA's Access to Employee Exposure and Medical Records standard (29 CFR 1910.1020). These records shall be available to employees so that they can examine the determination made by the employer.

The Cr(VI) standards require that exposure monitoring and medical surveillance records include the employee's Social Security number. Employers must grant access to exposure and medical records upon request by employees and their designated representatives, and by OSHA, per 1910.1020(e). If the employer provides other parties access to the exposure records, the Social Security numbers may be expunged from the records prior to allowing access.

The Access to Employee Exposure and Medical Records standard, [1910.1020](#), requires that employee exposure records be kept for at least 30 years and that



medical records be kept for the duration of the employee's employment plus an additional 30 years.

1. Paragraph (m)(1) of the general industry standard and paragraphs (k)(1) of the construction and shipyard standards require employers who perform air monitoring to determine employee Cr(VI) exposures, to maintain accurate records of such monitoring that identify the monitored employee and all employees whose exposures are represented by the monitoring. The employer is required to keep records for each exposure measurement taken. Specifically, records shall include the following information:
  - a. The date of measurement for each sample taken;
  - b. The operation involving exposure to Cr(VI) that was monitored;
  - c. Sampling and analytical methods used and evidence of their accuracy;
  - d. The number, duration, and results of samples taken;
  - e. The type of personal protective equipment used; and,
  - f. The name, Social Security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.
  
2. Paragraph (m)(2) of the general industry standard and paragraphs (k)(2) of the construction and shipyard standards require employers who use historical monitoring data to conduct exposure determinations to maintain records of this data. The records of historical monitoring must demonstrate that the data were obtained using a method sufficiently accurate under paragraph (d)(5) of the standards. The records must also show that the work being performed, the Cr(VI)-containing material being handled, and the environmental conditions at the time the historical monitoring data were obtained closely resemble those elements of the job for which exposure is being determined. Other data relevant to operations, materials, processing, or employee exposures must also be included in the records.
  
3. Paragraph (m)(3) of the general industry standard and paragraphs (k)(3) of the construction and shipyard standards require employers who use objective data to conduct exposure determinations to maintain records of this data. The records must include: the chromium-containing material in question; the source of the objective data; the testing protocol and results of testing, or analysis of the material for the release of Cr(VI); a description of the process, operation, or activity involved and how the data support the determination; and other data relevant to the process, operation, activity, material, or employee exposures.

4. Paragraph (m)(4) of the general industry standard and paragraphs (k)(4) of the construction and shipyard standards require employers to establish and maintain an accurate medical surveillance record for each employee subject to the medical surveillance requirements of the standards. Medical surveillance records are required to include the following information: The name, Social Security number, and job classification of the employee; a copy of the PLHCP's written opinions; and a copy of the information provided to the PLHCP. This information includes the employee's duties as they relate to Cr(VI) exposure, Cr(VI) exposure levels, and descriptions of personal protective equipment used by the employee (see paragraph (k)(4) in general industry, paragraph (i)(4) in shipyards and construction).

OSHA does not require the employer to create and maintain multiple copies of medical records. If records of previous employment-related medical exams are within the control of the employer, they do not need to be reproduced.

5. Inspection Guidelines. If the employer is following the scheduled monitoring option for exposure determinations, the compliance officer shall review the employer's air monitoring data to determine whether the employer is keeping an accurate record of all measurements taken as set forth in this recordkeeping paragraph. If the employer is following the performance-oriented option, or is using objective data to support a determination that the Cr(VI) standard does not apply per paragraph (a)(4), the compliance officer shall ask the employer for relevant records. (See [Section A.2.c](#), above, for evaluation criteria and enforcement policy where objective data are used by the employer to support a determination that the standard does not apply.)

The compliance officer shall also review the employer's medical surveillance records for employees exposed to Cr(VI). Whenever reviewing medical opinions, the compliance officer shall follow OSHA Instruction [CPL 02-02-072](#), *Rules of Agency Practice and Procedure Concerning OSHA Access to Employee Medical Records*.

The records shall be examined to determine if the employer is keeping employee exposure records for at least 30 years, and medical records for the duration of the employee's employment plus 30 years. Also note, 1910.1020(h)(1) requires that employers ceasing to do business shall transfer all employee exposure and medical records to the successor employer, if applicable.

6. Citation Guidelines. If the employer is following the scheduled monitoring option of the standards, and the employer has not maintained the required air monitoring records, paragraph (m)(1) of the general

industry standard or (k)(1) for construction or shipyards shall be cited. If the records are missing certain required elements, the appropriate subparagraph of (m)(1) for general industry or (k)(1) for construction or shipyards shall be cited.

If the employer is following the performance-oriented option but does not have the historical monitoring or objective data to support its exposure determinations, paragraph (m)(2)(i) or (m)(3)(i) of the general industry standard or (k)(2)(i) or (k)(3)(i) for construction or shipyards shall be cited. If the employer's historical or objective data records are missing certain required elements, the appropriate subparagraph of (m)(2) or (m)(3) for general industry, or (k)(1) or (k)(3) for construction or shipyards, shall be cited.

If the employer claims exemption from the Cr(VI) standard based on paragraph (a)(4), but the employer's objective data are not documented or maintained, the compliance officer shall perform air sampling to evaluate Cr(VI) exposures. If the sampling indicates there are Cr(VI) exposures, paragraph (m)(3)(i) of the general industry standard or (k)(3)(i) for construction or shipyards shall be cited, as well as any other applicable violations.

If the employer does not have any of the required medical surveillance records, paragraph (m)(4) of the general industry standard or (k)(4) for construction or shipyards shall be cited. If the records are missing certain required elements (e.g., physician's written opinion), the appropriate subparagraph of (m)(4) of the general industry standard or (k)(4) for construction or shipyards shall be cited.

If the employer is not maintaining employee exposure records or medical surveillance records in accordance with 1910.1020, the corresponding subparagraph (iii) of paragraph (m) in the general industry standard, or (k) in the construction or shipyards standards, shall be cited and grouped with the appropriate provision of 1910.1020. For example, if employee air monitoring records were not being maintained for at least 30 years, paragraph (m)(1)(iii) of the general industry standard or (k)(1)(iii) for construction or shipyards shall be cited and grouped with a violation of 1910.1020(d)(1)(ii).

N. Dates.

Paragraph (n) of the general industry standard and paragraphs (l) of the construction and shipyard standards establish start-up dates. Paragraph (n) of the general industry standard also references the appended settlement agreement creating an optional, alternative compliance schedule for eligible metal-finishing

and surface-finishing (electroplating) facilities.

See [Appendices A](#) and [C](#) for explanations and tabular summaries of start-up dates.

1. The Preamble to the Final Rule states that the standards became effective on May 30, 2006.
2. As of May 30, 2007, paragraphs (n)(1) and (n)(2) of the general industry standard, and paragraphs (l)(1) and (l)(2) of the construction and shipyard standards, require all employers to comply with most requirements of the standards.
3. Paragraph (n)(3) of the general industry standard and paragraphs (l)(3) of the construction and shipyard standards require employers to implement engineering controls required by paragraph (f) of the general industry standard and paragraphs (e) of the construction and shipyards standards within four years after the effective date, i.e., no later than May 31, 2010.

This four-year period is to ensure that employers have sufficient time to design, obtain, and install the necessary control equipment, and to develop and train employees on proper work practices. During the period in which employers are implementing these controls, respirators must be used to comply with the new PEL.

Paragraph (n)(3) was amended, a new paragraph (n)(4) was added, and a new Appendix A was added to the general industry standard as part of the settlement agreement with the Surface Finishing Industry Council (SFIC). The agreement allowed certain metal- and surface-finishing facilities the option to be relieved of certain respirator requirements if they agreed to implement engineering controls seventeen months earlier than the otherwise applicable deadline, i.e., by December 31, 2008.

A total of 27 electroplating facilities within federal OSHA states opted-in to the SFIC settlement agreement. The names, addresses, contact persons, and phone numbers for these facilities are listed, by Region, in [Appendix C](#).

4. Inspection Guidelines. If Cr(VI) exposures are measured above the PEL, the compliance officer shall determine if the employer has implemented feasible engineering and work practice controls, in accordance with paragraph (f)(1)(i) for general industry, or (e)(1)(i) for shipyards or construction. If, however, the inspection occurs before the deadline for the implementation of feasible engineering controls (May 31, 2010) and Cr(VI) overexposures are found, no citations shall be issued as long as exposed employees are provided with appropriate respiratory protection.

If overexposures are found, the compliance officer shall investigate whether the employer is planning to implement feasible engineering controls. Evidence of the employer's planning and start-up work includes purchased but uninstalled control equipment, engineering system design studies, plans, drawings, purchase orders, and/or initial construction work. (See above [Sections C.2.e](#) and [F.1.c](#) and [Appendix A](#) for a table and timeline summarizing start-up dates).

Before May 31, 2010, special enforcement procedures shall be followed at electroplating facilities that have opted-in to the SFIC settlement agreement (Appendix A to 1910.1026), in accordance with the terms of that agreement. These procedures include *no enforcement* of certain provisions for respiratory protection if the employer is complying with the terms of the agreement.

The compliance officer shall review the electroplating employer's exposure determinations, progress on implementation of accelerated engineering and work practice controls, provision of respiratory protection (as provided by the agreement), and employee training on the agreement.

Although certain provisions of the Cr(VI) respiratory protection standards are not enforced under the SFIC agreement, participating facilities have agreed to provide appropriate respiratory protection for employees that perform certain tasks where Cr(VI) exposures are expected to exceed the PEL (chemical preparation and handling, tank cleaning, and spray painting), for Cr(VI) exposures exceeding interim "respirator thresholds," and for any employees requesting a respirator. See [Appendix C](#) of this Directive for further details.

5. Citation Guidelines. If the employer is not planning to implement feasible engineering controls to address Cr(VI) overexposures by the deadline of May 31, 2010, the compliance officer shall inform the employer of the deadline and discuss the standards' requirements for engineering controls. If feasible engineering controls are not in place for Cr(VI) overexposures during this period and employees are not provided with appropriate respiratory protection, any overexposures shall be cited as a violation of 1910.1026(c), 1915.1026(c), or 1926.1126(c), as applicable, plus whatever deficiencies are found in any requirements for respiratory protection.. Citation procedures for combining and grouping violations shall be followed. A follow-up inspection after the deadline for engineering controls may be warranted if the compliance officer finds no evidence that the employer is installing or planning to install feasible engineering controls. (See above [Sections C.3.b](#) and [F.1.d.](#))

If an employer with an electroplating facility that has opted-in to the SFIC

settlement agreement (see [Appendix C](#) for a full list of these facilities) has *not* followed the terms of the agreement contained in Appendix A to 1910.1026, then the compliance officer or Area Director shall contact the Regional Administrator, who should coordinate with the National Office to determine whether the employer will be cited for any respirator violations found.

## **X. Interface with Other Standards.**

### **A. Other OSHA Standards.**

1. [29 CFR 1910.1000, Air Contaminants](#); [29 CFR 1915.1000, Air Contaminants](#); and [29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists](#).

These standards formerly listed PELs for chromic acid and chromates (as CrO<sub>3</sub>) and tert-Butyl chromate (as CrO<sub>3</sub>), which included Cr(VI) compounds. With the new substance-specific standards for Cr(VI), the Air Contaminants standards were revised to replace the table entries for chromates with references to the new Cr(VI) standards, with the caveat that the exposure limits in the former standards would continue to apply if the exposure limits in the new Cr(VI) standards are stayed or otherwise not in effect.

Several other standards that specifically refer to the Air Contaminants standards are indirectly affected by the new Cr(VI) standards. For example, the Ventilation standards, [1910.94](#) and [1926.57](#), in their requirements for operations where abrasive blasting of coated materials may create exposures to hazardous dusts, require the employer to keep the concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator below the levels specified in the applicable Air Contaminants standard. Similarly, the shipyard standard for Mechanical Paint Removers, [1915.34](#), requires employers to provide eye and respiratory protection to employees working in areas where unsafe concentrations of abrasive materials and dusts are present. Other standards which similarly refer to the Air Contaminants standards include those for welding and cutting operations (see Section 2, below).

2. [29 CFR 1910, Subpart Q, Welding, Cutting and Brazing](#); [29 CFR 1915, Subpart D, Welding, Cutting and Heating](#); [29 CFR 1917.152, Welding, Cutting and Heating \(Hot Work\)](#), and [29 CFR 1926, Subpart J, Welding and Cutting](#).

These standards contain requirements for welding and cutting operations, in which hexavalent chromium is one of the metals of toxic significance.

In evaluating compliance with the following provisions, the compliance officer may also need to determine whether employees are exposed above the new Cr(VI) PEL:

- a. [1910.252](#)(c)(1)(iii) (*Maximum allowable concentration*) and (c)(12) (*Cutting of stainless steels*).
- b. [1915.51](#)(b) (*Mechanical ventilation requirements*) and (d) (*Welding, cutting or heating of metals of toxic significance*).
- c. [1915.53](#)(d) (*Protection against toxic preservative coatings*).
- d. [1917.152](#)(f)(1) (*Mechanical ventilation requirements*), (f)(3) (*Welding, cutting or heating of toxic metals*), (f)(4) (*Inert-gas metal-arc welding*), and (g)(3) (*Welding, cutting and heating on preservative coatings*).
- e. [1926.353](#)(a) (*Mechanical ventilation*), (c) (*Welding, cutting or heating of metals of toxic significance*), and (e)(1) (*Welding, cutting, and heating*).
- f. [1926.354](#)(c) (*Protection against toxic preservative coating*).

Determination of appropriate enforcement policy where these standards overlap with the Cr(VI) standards may be aided by reviewing existing policies developed for situations where these standards overlapped with the Lead standards. (OSHA Instruction [STD 03-08-001](#), *Welding, Cutting or Heating of Metals Coated with Lead-Bearing Paint*, 10/30/1978.)

3. [29 CFR 1910.123](#), *Dipping and Coating Operations: Coverage and Definitions*; [29 CFR 1910.124](#), *General Requirements for Dipping and Coating Operations*; [29 CFR 1926.57](#), *Ventilation, Section (i) – Open Surface Tanks*.

These standards contain requirements for dip tanks in which objects are immersed in hazardous liquids for the purpose of cleaning or coating. Hexavalent chromium may be one substance used in dip tanks, e.g., chromic acid in electroplating. Provisions that have potential for interplay with the Cr(VI) standards are:

- a. [1910.123](#)(b) (*What operations are covered?*).
- b. [1910.124](#)(b) (*What ventilation requirements apply to vapor areas?*), (c) (*What requirements must I follow to recirculate exhaust air into the workplace?*), (h) (*What treatment and first aid must I provide?*), and (j) (*What must I do to inspect and maintain*

*my dipping or coating operation?).*

- c. [1926.57\(i\)\(2\)](#) (*Classification of open-surface tank operations*), [\(i\)\(8\)](#) (*Operation*), [\(i\)\(9\)](#) (*Personal protection*), and [\(i\)\(11\)](#) (*Inspection, maintenance, and installation*).

4. [29 CFR 1910.1025, Lead](#); [29 CFR 1915.1025, Lead](#); [29 CFR 1926.62, Lead](#).

Occupational exposures to lead chromate ( $\text{PbCrO}_4$ ) – which is a common paint formulation that contains both lead and Cr(VI) – are also regulated by the Lead standards. OSHA’s enforcement policy prior to the Cr(VI) standards required compliance officers to apply the Lead standards to lead chromate exposures, and any air samples collected where lead chromate was present were only analyzed for lead because the lead PEL -  $50 \mu\text{g}/\text{m}^3$  - was more protective than the previous PEL for chromates ( $\text{CrO}_3$ ) -  $100 \mu\text{g}/\text{m}^3$ .

However, the new Cr(VI) standards lower the permissible limit for Cr(VI), so that it now provides greater protection to employees exposed to lead chromate. Specifically, where airborne exposures are from lead chromate, and exposures are limited to the new Cr(VI) PEL of  $5 \mu\text{g}/\text{m}^3$ , the corresponding lead exposure is effectively limited to  $20 \mu\text{g}/\text{m}^3$ , which is two and a half times lower than the lead PEL of  $50 \mu\text{g}/\text{m}^3$ .

Where there are lead chromate exposures, OSHA will apply both the Cr(VI) standard and the Lead standard. Current laboratory analytical methods cannot accurately measure both lead and hexavalent chromium from one air sampling cassette. Thus, where it is practical for the compliance officer to collect dual air samples for operations involving exposures to lead chromate, sampling and analyses shall be performed for both hexavalent chromium and lead.

Note: Dual sampling for lead and Cr(VI) may be performed with one sampling pump attached to two sampling cassettes using a “Y” splitter in the connecting tubing. Employees are thus only encumbered by one pump. However, if the pump fails, both samples may be lost. The compliance officer should therefore contact the analytical laboratory for specific procedures prior to collecting dual air samples for lead and Cr(VI).

If it is only practical to collect one air sample, the compliance officer should consider preferentially sampling for Cr(VI) because of its lower PEL. On the other hand, sampling for lead may be more appropriate where potential reproductive hazards of lead are present to pregnant employees or those of child-bearing age. The compliance officer shall consult with his/her Area Director to determine the best sampling strategy



in such cases.

In preparing this Cr(VI) Directive, OSHA reviewed existing toxicological studies and did not find data showing that the common effects of lead and Cr(VI) are *known* to be additive. Therefore, compliance officers are instructed to *not* apply the mixture formula in 1910.1000(d)(2)(i), or 1915.1000(d)(2)(i), until any additive health effects become known. (Note that the mixture formula is not in 1926.55.)

Where the compliance officer finds overexposures to both lead and Cr(VI) in workplaces using lead chromates, violations of both the Cr(VI) PEL and the lead PEL shall be cited. Two separate penalties shall be assessed on one serious citation. Additionally, violations of other applicable provisions of both the Lead and Chromate (VI) standards that are triggered by their PELs, such as respiratory protection and exposure monitoring, shall be cited as appropriate.

5. [29 CFR 1910.1018, Inorganic Arsenic; 29 CFR 1915.1018, Inorganic Arsenic; 29 CFR 1926.1118, Inorganic Arsenic.](#)

Occupational exposures to compounds containing both arsenic and Cr(VI) (such as arsenical pesticides, e.g., chromated copper arsenate, that may be used in pressure-treated wood), are also regulated by the Inorganic Arsenic standards. No specific OSHA enforcement policy has directed compliance officers to preferentially air sample for arsenic, although the compliance officer is expected to apply the strictest exposure limit when measuring employee exposures.

Note that any operations involving the *application of pesticides*, such as CCA, are not covered by the Cr(VI) or Inorganic Arsenic standards. Furthermore, OSHA's Inorganic Arsenic standards additionally exclude employee exposures in *agriculture* and resulting from *uses of arsenically preserved wood*. Thus, industrial operations involving the *manufacture of pesticides* are covered by both the Arsenic standards and Cr(VI) standards, but construction operations *utilizing pesticide-treated products* are only covered by the Cr(VI) standards.

Current laboratory analytical methods cannot accurately measure both arsenic and hexavalent chromium from one air sampling cassette. Thus, where it is practical for the compliance officer to collect dual air samples for operations involving exposures to compounds containing arsenic and hexavalent chromium, sampling and analyses shall be performed for both chromium and inorganic arsenic. (Note, see [Section X.A.4](#), above, for further discussion on dual sampling.) If it is only practical to collect one air sample, the compliance officer should consider preferentially sampling

for Cr(VI) because of its lower PEL.

In preparing this Cr(VI) Directive, OSHA reviewed existing toxicological studies and did not find data showing that the common effects of Cr(VI) and arsenic are *known* to be additive. Therefore, compliance officers are instructed *not* to apply the mixture formula in 1910.1000(d)(2)(i), or 1915.1000(d)(2)(i), until any additive health effects become known. (Note that the mixture formula is not in 1926.55.)

Where exposures exceed both the arsenic and Cr(VI) PELs, violations of both the Cr(VI) PEL and the arsenic PEL shall be cited, and two separate penalties shall be assessed on one serious citation. Additionally, violations of other provisions of both the Arsenic and Cr(VI) standards that are triggered by their PELs, such as respiratory protection and exposure monitoring, shall be cited when appropriate.

OSHA directive, [CSP 02-01-001](#), *Consultation for Wood Treatment Operations Utilizing Inorganic Compounds*, 9/09/1986, may also be impacted by the new Cr(VI) standards. The directive established policy for State consultation services to the wood preservative industry. State consultation offices responding to employer requests for comprehensive consultation are instructed to address any overexposures to inorganic arsenic from the application of pesticides in accordance with EPA regulations and not OSHA's Inorganic Arsenic standards.

Similarly, any overexposures to Cr(VI) in the application of pesticides that may be found by State consultation visits to the wood preservation industry cannot be cited under the Cr(VI) standards. However, the consultant may use the new Cr(VI) standards and this Cr(VI) Directive as a source of information and guidance for the employer. Furthermore, the instruction for compliance officers, concerning their own use of personal protective equipment and other precautions regarding their own exposure to Cr(VI), should be heeded by consultants whenever they are applicable.

6. [29 CFR 1910.134](#), Respiratory Protection.

The Respiratory Protection standard contains requirements for program administration, worksite-specific procedures, employee training, fit testing, and respirator use, cleaning, maintenance and repair. Paragraphs 1910.1026(g)(2), 1915.1026(f)(2), and 1926.1126(f)(2) require the employer to implement a respiratory protection program in accordance with 1910.134.

Employers whose employees use respirators for protection against Cr(VI) must select a respirator that will provide the appropriate protection against Cr(VI) levels in the work area. The Assigned Protection Factors (APFs)

table in the Respiratory Protection standard, 1910.134(b), shows the level of respiratory protection that a given respirator or class of respirators is expected to provide to properly fitted and trained users when the employer has implemented a continuing, effective respiratory protection program.

7. 29 CFR 1910.1020, Access to Employee Exposure and Medical Records.

The Access to Employee Exposure and Medical Records standard is incorporated by reference into the recordkeeping requirements, paragraph (m) of the general industry Cr(VI) standard, and paragraphs (k) of the construction and shipyards Cr(VI) standards. Under these recordkeeping paragraphs, employers are required to retain medical and exposure records and allow employees to access them in accordance with 1910.1020. Employers are also required to transfer these records in accordance with 1910.1020. Additionally, requirements for providing OSHA compliance officers with access to these records are provided in 1910.1020.

8. 29 CFR 1910.1200, Hazard Communication.

- a. The Hazard Communication standard (HCS) is referenced in the subparagraphs on removal and storage of protective work clothing and equipment, paragraph (h)(2) for general industry, and paragraphs (g)(2) for construction and shipyards. Specifically, where bags or containers of contaminated clothing or equipment are removed for laundering, cleaning, maintenance, or disposal, they shall be labeled in accordance with the HCS.
- b. Similarly, under the general industry standard's subparagraph on disposal of wastes, under housekeeping paragraph (j)(3)(iii), bags or containers of Cr(VI) waste, scrap, or debris consigned for disposal are required to be labeled in accordance with the HCS.
- c. The HCS is also referenced in the paragraph requiring communication of Chromium (VI) hazards to employees, paragraph (l) for general industry, and paragraphs (j) for construction and shipyards. As noted above, where employees are exposed to Cr(VI), there is a pre-existing duty under the HCS to provide communication and training on health hazards associated with Cr(VI) exposure (1910.1200(h)(3)(ii)); on the location, manner of use and release of Cr(VI) (1910.1200(h)(2)(ii)); on engineering controls and work practices associated with the employee's job assignment (1910.1200(h)(3)(iii)); on the purpose, selection and use of respirators and protective clothing (1910.1200(h)(3)(iii)); on emergency procedures (1910.1200(h)(3)(i)); and on measures employees can take to

protect themselves (1910.1200(h)(3)(iii)).

- d. Manufacturers of any materials containing Cr(VI) must revise their material safety data sheets (MSDSs), to update the PEL for Cr(VI) ingredients. Additionally, even though the Cr(VI) standards specifically exclude portland cement, the Hazard Communication standard contains no such exclusion. Therefore, manufacturers of portland cement must continue to provide information about Cr(VI) hazards on their MSDSs. Similarly, employers with employees who are exposed to portland cement must continue to communicate Cr(VI) hazards to affected employees. (See [Appendix C](#) for more discussion on portland cement operations.)

9. [29 CFR 1910.141, Sanitation; 29 CFR 1915.97, Health and Sanitation; and 29 CFR 1926.51, Sanitation.](#)

The Cr(VI) standards' paragraphs for Hygiene Areas and Practices - paragraph (i) for general industry and paragraphs (h) for construction and shipyards - references OSHA's general sanitation requirements, which already address change rooms (employers shall provide change rooms in conformance with [1910.141](#) for general industry and shipyards, and [1926.51](#) for construction); washing facilities (employers shall provide washing facilities in conformance with [1910.141](#) for general industry, [1915.97](#) for shipyards, and [1926.51](#) for construction); and, eating and drinking areas (employers shall provide eating and drinking areas in conformance with [1910.141](#) for general industry, [1915.97](#) for shipyards, and [1926.51](#) for construction).

10. [29 CFR 1910, Subpart I – Personal Protective Equipment; 29 CFR 1915, Subpart I – Personal Protective Equipment; 29 CFR 1926, Subpart E – Personal Protective and Life Saving Equipment.](#)

The preamble of the Cr(VI) Final Rule mentions that the Cr(VI) standards' requirements for protective clothing and equipment are essentially equivalent to the requirements in OSHA's Personal Protective Equipment (PPE) standards. The additional requirements in the Cr(VI) standards address practices associated with the use of protective clothing and equipment, e.g., removal, storage, cleaning, and replacement.

The Cr(VI) standards require the employer to provide appropriate protective clothing and equipment where a hazard is present or is likely to be present from skin or eye contact with Cr(VI). To make this determination, the employer must evaluate the workplace. This performance-oriented requirement is consistent with the requirements of OSHA's general PPE standards. The general PPE standards require the

employer to assess the workplace for chemical hazards associated with eye and skin contact.

11. 29 CFR 1910.151, Medical Services and First Aid; 29 CFR 1917.95, Other Protective Measures; 29 CFR 1926.50, Medical Services and First Aid.

Although not referenced in the Cr(VI) standards, these other standards include a provision for employers to provide emergency showers and eyewashes where there are exposures to corrosives or otherwise acute-acting contaminants, such as the chromic acid commonly used in plating shops. This Directive contains instructions for compliance officers to consider grouping the appropriate general first aid standard with the Cr(VI) standard's section on hygiene areas and practices where violations are found involving emergency showers in workplaces with exposures to chromic acid.

B. Other Agencies' and Organizations' Standards.

1. Environmental Protection Agency (EPA).

- a. Clean Air Act (CAA), 42 USC § 7401 (1970). The CAA requires the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. The EPA established the National Emissions Standards for Hazardous Air Pollutants (NESHAP) to protect the public. Chromium is one of the hazardous air pollutants regulated, and the EPA promulgated the Chromium NESHAP in 40 CFR Part 63, Subpart N.

The Chromium NESHAP, 40 CFR Part 63, Subpart N, specifies air pollution control techniques to be used to control chromium emissions from hard and decorative chromium electroplating and chromium anodizing tanks.

- b. Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 (1976). RCRA gave EPA the authority to control hazardous waste, including generation, transportation, treatment, storage, and disposal. In 40 CFR 261.24, RCRA lists chromium as one of several toxic substances that may characterize a hazardous waste. 40 CFR 261 also lists specific wastes that are hazardous because of their chromium content. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.
- c. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund"), 42 USC § 9601 (1980). CERCLA provides for a Federal "Superfund" to clean up

uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA has power to seek out those parties responsible for any release and assure their cooperation in cleanup. 40 CFR 302.4 includes chromium on its list of CERCLA hazardous substances.

- d. Toxic Substances Control Act (TSCA), 15 USC § 2601 (1976). TSCA gives EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. EPA screens these chemicals and can require reporting or testing of those that may pose an environmental or human-health hazard. EPA can ban the manufacture and import of chemicals that pose an unreasonable risk. 40 CFR 749.68 regulates hexavalent chromium-based water treatment chemicals in cooling systems.
- e. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 USC § 136 (1996). FIFRA provides federal control of pesticide distribution, sale, and use. FIFRA gives EPA authority to study the consequences of pesticide usage and to require users (farmers, utility companies, and others) to register when purchasing pesticides. All pesticides used in the U.S. must be registered (licensed) by EPA. Registration assures that pesticides will be properly labeled and that if used in accordance with specifications, will not cause unreasonable harm to the environment. Pesticide users also must take exams for certification as applicators of pesticides. See 40 CFR 170 (*Worker Protection Standard*).

Note that any operations involving the *application of pesticides*, such as the hexavalent chromium compound, chromated copper arsenate, are regulated by the EPA. Additionally, as mentioned in the preceding section, OSHA has a directive for Cooperative and State Programs applicable to arsenical pesticides and the standards for inorganic arsenic, which could also be impacted by the new Cr(VI) standards ([CSP 02-01-001](#), *Consultation for Wood Treatment Operations Utilizing Inorganic Compounds*, 9/09/1986).

## 2. Occupational Exposure Limits of Other Agencies and Organizations.

OSHA's PEL of an 8-hour TWA at  $5 \mu\text{g}/\text{m}^3$  shall be enforced by OSHA compliance officers for occupational exposures to all Cr(VI) compounds. Employers may further limit their workplace exposures to lower levels recommended by other agencies and organizations. For example, NIOSH has a recommended exposure limit (REL) of  $1 \mu\text{g}/\text{m}^3$  for chromic acid and chromates as a 10-hour TWA. In addition, the American Conference of Governmental Industrial Hygienists (ACGIH<sup>®</sup>) recommends Biological

Exposure Indices (BEIs<sup>®</sup>), as urine levels of chromium, to measure an employee's body burden from exposures to water soluble Cr(VI) fume at the end of the employee's work shift and work week.

## **XI. Drafting OSHA Citations for Cr(VI) Violations.**

The compliance officer shall follow the general procedures for writing OSHA citations in the FIRM, [CPL 02-00-103](#), and any specific procedures in this Cr(VI) Directive. The recommended classification of violations shall be as per the FIRM, Section 7, Chapter III, or as per subsequent revisions. Violations of the Cr(VI) standards will generally be classified as "serious" given the potential for severe impairment of health.

OSHA has developed Standard Alleged Violation Elements (SAVEs) specific to the Cr(VI) standards for use by compliance officers to ensure consistent writing of citations. These Cr(VI) SAVEs are available on OSHA's internal intranet website. If there is no SAVE that covers the alleged violation, the compliance officer shall develop the alleged violation description using existing procedures. (See OSHA Instructions [CPL 02-00-032, Maritime SAVEs Manual](#), [CPL 02-00-034, Construction SAVEs Manual](#), and [CPL 02-00-035, Regulatory and General Industry SAVEs Manual](#).)

The general procedures for classifying and grouping violations in the FIRM shall be followed. This Cr(VI) Directive also contains some specific instructions for grouping violations of multiple provisions within the Cr(VI) standards and for grouping violations of one or more provisions of a Cr(VI) standard and other OSHA standards. Deviations that appear appropriate, however, may be addressed with the Regional Office.

## **XII. Training for OSHA Personnel.**

For all inspections on a site where Cr(VI) exposures are expected, compliance officers and consultants are expected to be knowledgeable of:

- A. Potential hazards which may be encountered at the site, including the potential hazards of Cr(VI), including skin irritation and lung cancer.
- B. Contents of the Cr(VI) standards and this Directive.
- C. Appropriate PPE to be worn. Each compliance officer and consultant who will be expected to use PPE shall be trained in the proper care, use, and limitations of the PPE. Use of respiratory protection by compliance officers and other Agency personnel is addressed in OSHA Instruction [CPL 02-02-054, Respiratory Protection Program Guidelines](#).
- D. Emergency procedures.
- E. Disposal of Cr(VI) waste generated by the compliance officer or consultant, housekeeping practices, and hygiene provisions.



### **XIII. Medical Examinations for OSHA Personnel.**

Many of the hazards that compliance officers and consultants may encounter are specifically addressed by the medical surveillance requirements in OSHA standards. In accordance with OSHA personnel policy in OSHA Instruction [PER 04-00-003](#), *CSHO Medical Examinations*, Regional Administrators and Area Directors are responsible for implementing a medical examination program for employees with duties of compliance officers and consultants.

OSHA Instruction [CPL 02-02-054](#), *Respiratory Protection Program Guidelines*, includes medical evaluation requirements for OSHA personnel required to wear respiratory protection. The instruction requires that compliance officers and consultants be medically evaluated and found eligible to wear the respirator selected for their use prior to fit testing and first-time use of the respirator in the workplace. Compliance officers and consultants who are required to wear any respiratory protection shall be medically cleared via the CSHO Medical Examination procedures.

### **XIV. Protection of OSHA Personnel.**

Compliance officers and consultants are reminded to use appropriate personal protective equipment when they are exposed to a hazard. Compliance officers and consultants shall not enter a Cr(VI)-regulated area, or other area where exposures are likely to exceed the PEL, unless it is absolutely necessary. For inspection and air sampling activities, remote operations are encouraged when practical.

#### **A. Personal Protective Equipment (PPE).**

Regional Administrators and Area Directors shall ensure that appropriate PPE is available for compliance officers and consultants.

1. Compliance officers and consultants shall wear appropriate respiratory protection when entering a Cr(VI)-regulated area, or other area where exposures are likely to exceed the PEL.

In many cases, a compliance officer or consultant may find that an employer's exposure determination is inadequate or has not been performed at all, so professional judgment may be needed in anticipating exposure during a brief entry into a regulated area for inspection. Compliance officers and consultants shall comply with the Regional Administrator's respiratory protection program, as it may require the use of respiratory protection during even brief entries into Cr(VI)-regulated areas (or any other areas with carcinogenic or acute inhalation hazards).

Respirators shall be selected in accordance with the respirator selection procedures in [CPL 02-02-054](#), *Respiratory Protection Program Guidelines*. Respirators shall also meet OSHA's assigned protection



factors (APFs), as set forth in 1910.134.

2. Besides respiratory protection, compliance officers and consultants shall wear appropriate protective work clothing and equipment as needed to avoid skin and eye contact from Cr(VI) compounds. Such clothing and equipment may include disposable coveralls with hood, foot coverings or boots, gloves, safety goggles and/or face shield.
3. Whenever handling Cr(VI) materials, such as when collecting wipe or bulk samples, compliance officers and consultants shall wear PVC or nitrile gloves with sufficient chemical resistivity and degradation resistance as per the manufacturer's performance specifications. Do not wear powdered gloves. Additionally, if 1% NaOH-coated, binderless quartz fiber filters are used for wipe sampling, gloves must provide sufficient protection from the caustic NaOH coatings on the filters.

B. CSHO Exposure Determination.

Regional Administrators and Area Directors shall ensure that Cr(VI) exposure determinations, in accordance with the provisions of 29 CFR 1910.1026(d), are made for compliance officers and consultants who may be required to enter regulated areas for significant durations or who may otherwise be significantly exposed or potentially significantly exposed to Cr(VI) during worksite inspections or sampling activities.

C. Cleaning, Hygiene, and Waste Disposal.

Prior to site entry, compliance officers and consultants shall determine if hygiene facilities and disposal containers exist, whether they are adequate for the expected conditions at the site, and if they will be available for OSHA's use.

1. When a compliance officer or consultant enters areas at a worksite where skin or eye contact with Cr(VI) compounds is likely, the compliance officer or consultant shall use the employer's change rooms, washing facilities, and disposal containers for donning, doffing, and disposing of protective clothing and removing Cr(VI) from the skin.
2. If washing facilities are nonexistent, inadequate, or not available for use, a compliance officer or consultant shall determine if adequate hygiene can be provided. If it is determined that cleaning and hygiene cannot be adequately provided, a supervisor shall be contacted for guidance.

## APPENDIX A

### START-UP DATES AND INTERIM ENFORCEMENT POLICIES FOR CHROMIUM (VI) STANDARDS

U.S. Department of Labor

Occupational Safety and Health Administration  
Washington, D.C. 20210

Reply to the attention of:



JUN 23 2006

MEMORANDUM FOR: REGIONAL ADMINISTRATORS

FROM: *Richard E. Fairfax*  
RICHARD E. FAIRFAX, DIRECTOR  
DIRECTORATE OF ENFORCEMENT PROGRAMS (DEP)

SUBJECT: Interim guidelines until publication of final OSHA Instruction,  
*Inspection Guidelines for the Hexavalent Chromium Standards*

The effective date of the new hexavalent chromium standards is May 30, 2006. The OSHA Compliance Instruction (Directive) is currently under review. Until this Directive is issued, we are forwarding the attached enforcement guidance. The new standard provides for 6-month and 12-month start-up periods for large (20 or more employees) and small (19 or fewer employees) employers, respectively, to comply with the new PEL and other requirements. All employers have until May 31, 2010, however, to implement required engineering controls.

The Cr(VI) Final Rule amended the Air Contaminants standards (1910.1000, 1915.1000, and 1926.55) so that the table entries with the old PELs for chromic acid and chromates now refer to the new PELs in the Cr(VI) standards (1910.1026, 1915.1026, and 1926.1126). However, these table entries are footnoted with a provision that the [old] exposure limit applies to any operations or sectors for which the new Cr(VI) standard is stayed or otherwise not in effect. Therefore, the old, outgoing PELs will continue to be enforceable during the 6- and 12-month start-up periods, i.e., until November 27, 2006, for those employers with 20 or more employees and until May 30, 2007, for those employers with 19 or fewer employees.

During these 6-month and 12-month start-up periods, compliance officers inspecting workplaces with hexavalent chromium exposures should determine if exposures exceed the new PEL of 5  $\mu\text{g}/\text{m}^3$  (as Cr(VI)), or if exposures exceed the outgoing PELs for chromic acid and chromates of 0.1  $\text{mg}/\text{m}^3$  (as  $\text{CrO}_3$ ) - a ceiling limit for general industry and an 8-hour TWA for construction and shipyards industries. OSHA's Salt Lake Technical Center currently provides analytical results for all chromate samples to include analyses in terms of both Cr(VI) and  $\text{CrO}_3$ , so no additional sampling is required.

Any Cr(VI) exposures exceeding the new PEL after the start-up periods but before the deadline for engineering controls (May 31, 2010) are citable only where employees are not protected by respiratory protection. Attached for your information are two pages containing a table and a timeline that summarize these start-up periods and our corresponding enforcement policies. This enforcement guidance will be incorporated into our final Directive. If you have any questions, please contact Melody Sands or Larry McGowan, Office of Health Enforcement, ext. 3-2190.

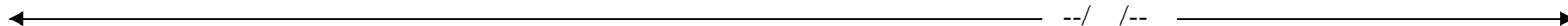
Attachments

### Start-up Dates and Enforcement Policies for Chromium (VI) Standards

Dates	Time Period of New Chromium (VI) Standards and Employer Requirements	OSHA Enforcement Policy During this Time Period
<p><b>May 30, 2006</b> - Effective date for new Chromium (VI) standards, 1910.1026, 1915.1026, and 1926.1126. The outgoing standards for chromic acid and chromates (as CrO<sub>3</sub>) in 1910.1000, 1915.1000, and 1926.55 are enforceable during the 6-month and 12-month start-up periods.</p>		
<p><b>Nov. 27, 2006</b> - Start-up date for employers w/ 20 or more employees.</p> <p style="text-align: center;">-----</p> <p style="text-align: center;">6 months from effective date</p>	<p>Time period between <b>effective date</b> and <b>start-up date</b> for <b>larger employers</b> with 20 or more employees allows these employers sufficient time to complete initial exposure assessments, establish regulated areas (for general industry) where required, obtain appropriate protective work clothing and equipment, and comply with other provisions.</p>	<p><b>During this start-up period</b> – New Cr(VI) provisions are not enforceable yet, but if CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, notify employer of intent for follow-up. If CSHO measures CrO<sub>3</sub> exposure exceeding the outgoing PEL, enforce the outgoing standard.</p>
<p><b>May 30, 2007</b> - Start-up date for employers w/ 19 or fewer employees.</p> <p style="text-align: center;">-----</p> <p style="text-align: center;">12 months from effective date</p>	<p>Time period between <b>effective date</b> and <b>start-up date</b> for <b>smaller employers</b> with 19 or fewer employees allows these employers sufficient time to complete initial exposure assessments, establish regulated areas (for general industry) where required, obtain appropriate protective work clothing and equipment, and comply with other provisions.</p>	<p><b>After this start-up period</b> – All new Cr(VI) provisions are enforceable, except engineering controls. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, cite violation unless respirators are being used to comply with Cr(VI) PEL and inform employer to begin plans for implementing feasible engineering controls.</p>
<p><b>May 31, 2010</b> - Deadline for all employers.</p> <p style="text-align: center;">-----</p> <p style="text-align: center;">4 years from effective date</p>	<p>Time period between <b>effective date</b> and <b>deadline</b> for installing feasible <b>engineering controls</b> - allows all employers sufficient time to complete the process of designing, obtaining, and installing the necessary control equipment.</p>	<p><b>Until this deadline</b> - New Cr(VI) provisions for engineering controls are not enforceable yet, but after the 6-month and 12-month start-up dates, <b>respirators shall be used</b> to comply with the PEL.</p> <p><b>After this deadline</b> – Feasible engineering controls are enforceable; all employers shall have installed them where needed. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, cite applicable violations of Cr(VI) PEL and engineering controls.</p>

## Timeline of Dates and Enforcement Policies for Chromium (VI) Standards

Final Rule Cr(VI) Feb. 28, 2006	Effective Date May 30, 2006	Start-up Date (20 or more employees) Nov. 27, 2006	Start-up Date (19 or fewer employees) May 30, 2007	Deadline (Engineering controls) May 31, 2010



^^

Employers obtain and read Chromium (VI) standards, plan and prepare for compliance.

..... ^^

New Cr(VI) PEL is in effect; outgoing CrO<sub>3</sub> PELs are enforceable during 6- and 12-month start-up periods. Employers perform initial exposure assessments, procure respirators, protective clothing and equipment. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, notify employer of intent to follow-up. If CSHO measures CrO<sub>3</sub> exposure exceeding the outgoing PEL, enforce the outgoing standard.

..... ^^

Employers with 20 or more employees shall comply with all provisions except engineering controls. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, cite violation unless respirators are being used to comply with Cr(VI) PEL, and inform employer to begin plans for implementing feasible engineering controls.

..... ^^

Employers with 19 or fewer employees shall comply with all provisions except engineering controls. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, cite violation unless respirators are being used to comply with Cr(VI) PEL, and inform employer to begin plans for implementing feasible engineering controls.

..... ^^

All employers shall have installed feasible engineering controls, where needed. If CSHO measures exposure exceeding 5 µg/m<sup>3</sup>, cite applicable violations of Cr(VI) PEL and engineering controls.

## APPENDIX B

### CR(VI) COMPOUNDS AND TYPICAL INDUSTRIES/OPERATIONS WITH CR(VI) EXPOSURES

#### Common Cr(VI) Compounds

Acid copper chromate (ACC) - formulation of cupric oxide, CuO, and chromic acid, CrO <sub>3</sub>	Chromic sulfate, Cr(OH)SO <sub>4</sub>
Ammonium dichromate, (NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Lead chromate, PbCrO <sub>4</sub>
tert-Butyl chromate, [(CH <sub>3</sub> ) <sub>3</sub> CO] <sub>2</sub> CrO <sub>2</sub>	Potassium chromate, K <sub>2</sub> CrO <sub>4</sub>
Calcium chromate, CaCrO <sub>4</sub>	Potassium dichromate, K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
Chromated copper arsenate (CCA) - formulation of arsenic pentoxide, As <sub>2</sub> O <sub>5</sub> , chromic acid, CrO <sub>3</sub> , and cupric oxide, CuO	Sodium chromate, Na <sub>2</sub> CrO <sub>4</sub>
	Strontium chromate, SrCrO <sub>4</sub>
Chromic acid (H <sub>2</sub> CrO <sub>4</sub> ), chromium trioxide (CrO <sub>3</sub> ), or chromium oxide	Zinc chromate, ZnCrO <sub>4</sub>

## Typical Industries/Operations with Cr(VI) Exposures

Industry/Operation	Comment / Typical Cr(VI) Chemical Used
Manufacture of chromates	Various Cr(VI) compounds
Iron and steel foundries; steel mills; forging	Chromium metal, Cr(VI) fume
Welding <sup>1</sup> of stainless steel or Cr(VI) coatings	Cr in steel oxidized to Cr(VI) fume when welded or torch-cut
Manufacture of pesticides (applications are excluded from Cr(VI) standards)	CCA and ACC
Manufacture of glass	Sodium dichromate dihydrate, Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> [H <sub>2</sub> O] <sub>2</sub>
Cleaning laboratory glassware	Potassium dichromate
Electroplating; chrome plating	Chromic acid
Construction with pressure-treated wood (manufacturing of pressure-treated wood is excluded in the Cr(VI) standards)	CCA and ACC
Operations with portland cement	Excluded from Cr(VI) standards
Manufacture of chromate pigments and dyes	Dichromates, lead chromate (chrome yellow); strontium chromate; zinc chromate
Painting (aerospace, auto body repair, traffic markings); paint removal from steel structures	Lead chromate, zinc chromate, strontium chromate
Fiberglass production	Cr(VI) contaminants formed in furnace

<sup>1</sup> Factors that can affect the concentration of Cr(VI) in the welding fume include the composition of the base metal and the welding consumable (electrodes or welding rods), as well as the chromium content of surface coatings on the base metal. Exposures tend to be higher for welding on stainless steel (12-30% chromium) compared with welding on carbon steel (generally 3% chromium or less). Also, the more confined the working space or the absence of effective exhaust, the higher the concentration of welding fume.

The type of welding method used can also affect the fume generation rate (FGR) and, therefore, the welder's potential exposure to Cr(VI). Welding operations such as manual metal arc (MMA) welding or stick welding, also known as shielded metal arc welding (SMAW), tend to produce higher fume rates. Most repair welding is done using SMAW due to its low cost, portability, and ease of use. Other types of welding that also tend to produce high fume rates are gas metal arc welding (GMAW), also known as metal inert gas (MIG) welding, and flux-cored arc welding (FCAW); these methods are semi-automatic or automatic welding processes. Welding methods that tend to produce lower fume rates are gas tungsten arc welding (GTAW), also known as tungsten inert gas (TIG) welding, and submerged arc welding (SAW). (71 FR 10262)

Finally, welding parameters such as higher current/voltage and higher oxygen or carbon dioxide percentage in the shielding gas tend to increase the FGR. A suggested reference on characteristics of welding processes is Chapter III of the [NIOSH Criteria for a Recommended Standard on Welding, Brazing, and Thermal Cutting](#).

## APPENDIX C

### EXCLUSIONS IN THE CHROMIUM (VI) STANDARDS

The function of this appendix is to present a summary of the exclusions in OSHA's standards for hexavalent chromium. This appendix also presents the compliance officer with appropriate enforcement policies for portland cement operations, pesticide operations, and at electroplating job shops that opted-in to the SFIC settlement agreement.

Standard	Specific Exclusion	Typical Work Operations
1910.1026(a)(3) 1915.1026(a)(3) 1926.1126(a)(3)	Exposures in work with portland cement.	Manufacture of portland cement; mixing cement; working wet concrete, mortar, grout, bricklaying; cutting and hammering concrete; cement plant; cinder block manufacturing.
1910.1026(a)(2) 1915.1026(a)(2) 1926.1126(a)(2)	Exposures in work <i>applying</i> pesticides containing Cr(VI).	Manufacture of pressure-treated wood with chromated copper arsenate (CCA) and acid copper chromate (ACC).
1910.1026(a)(4) 1915.1026(a)(4) 1926.1126(a)(4)	Where an employer has objective data showing a work operation cannot release dusts, fumes, or mists of Cr(VI) in concentrations at or above 0.5 µg/m <sup>3</sup> as an 8-hour TWA under any expected conditions of use.	See examples in corresponding section of text, below.
1910.1026(n)(3)- (n)(4) and Appendix A	Electroplating job shops that opted-in to the SFIC settlement agreement agreed to accelerate implementation of engineering controls by 17 months, in exchange for relief from OSHA enforcement of certain respiratory protection provisions.	

## **Section C-1. Portland Cement Inspection Procedures**

Portland cement is one of the most widely-used formulations of cement in construction and the occupational health hazards are generally well known. These include inhalation, dermal, and eye hazards, some of which result from trace constituents generally found in portland cement, including hexavalent chromium (“Cr(VI)”). Cr(VI) is a trace constituent of portland cement not because it is an added ingredient but because it is a contaminant that enters the mixture during its manufacture. Generally there is less than 20 µg Cr(VI) per gram of cement, or 20 parts per million (ppm).

OSHA’s Cr(VI) standards do not apply to operations with portland cement because OSHA determined that compliance with pre-existing OSHA general standards provides adequate protection for employees exposed to the trace amounts of Cr(VI) found in portland cement. The applicable OSHA standards are those for air contaminants, personal protective equipment, sanitation, and hazard communication. This Appendix explains how these standards, and OSHA's recordkeeping regulations, are to be enforced at workplaces, primarily construction workplaces, where employees are exposed to portland cement. A one-page [checklist](#) is also included to assist compliance officers in these inspections. For all OSHA inspections where compliance officers find employee exposures to portland cement, the OSHA-1 forms shall be marked with following coding for future tracking purposes:

**OSHA-1.....Block 42:    Type = N    ID = 11    Value = Portland**

**Dermal and Eye Hazards:** Exposure to dry portland cement may cause drying of the skin and mild irritation, or more significant effects from the aggravation of other conditions. Wet portland cement is caustic (pH > 12) and dermal exposure may cause more severe skin effects, including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of chemical (caustic) burns. Eye exposures to portland cement may cause immediate or delayed irritation or inflammation of the cornea. Eye contact with larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness.

Some individuals who are exposed to portland cement may exhibit an allergic response, which can result in symptoms ranging from mild rashes to severe skin ulcers. Cement dermatitis may be irritant contact dermatitis induced by the alkaline, abrasive, and hygroscopic (water-absorbing) properties of portland cement, or it may be allergic contact dermatitis elicited by an immunological reaction to Cr(VI), or it may be a combination of the two.

**PPE:** OSHA’s general standards for personal protective equipment (PPE), [29 CFR 1910.132](#) for general industry, [29 CFR 1915.152](#) for shipyards, and [29 CFR 1926.95](#) for construction, require employers to ensure that appropriate PPE is provided, effectively used, and maintained. Appropriate PPE should include boots and gloves, and may also include eye protection, such as safety glasses with side shields or goggles, in some circumstances. Such equipment must be maintained in a sanitary and reliable condition when not in use, and employees must be able to



clean or exchange their equipment if it becomes ineffective or contaminated on the inside with cement. In addition to long-sleeved shirts and long pants, protective clothing such as coveralls may also be appropriate to prevent the skin from coming in contact with cement.

Because the general PPE standards provide protection essentially equivalent to the PPE provision in the Cr(VI) standards, compliance with them should provide adequate protection against the Cr(VI) hazards from portland cement. Compliance officers must confirm that appropriate PPE is provided, used, and maintained.

**Sanitation:** The requirements for washing facilities in OSHA's general sanitation standards are also comparable to the hygiene provisions found in the Cr(VI) standards. For example, OSHA's Sanitation standard for general industry explicitly requires that lavatories with running water, hand soap, and individual hand towels or air-blowers be available in all places of employment. See [29 CFR 1910.141\(d\)\(2\)](#).

In construction operations where employees may be exposed to harmful contaminants, the sanitation standard requires employers to "provide adequate washing facilities . . . in near proximity to the worksite [that must] be so equipped as to enable employees to remove such substances." [29 CFR 1926.51\(f\)\(1\)](#).<sup>1</sup> The shipyards sanitation standard similarly requires "adequate washing facilities for employees engaged in . . . operations where contaminants can, by ingestion or absorption, be detrimental to the health of the employees." [29 CFR 1915.97\(b\)](#). In order to effectively remove portland cement, employers must provide washing facilities with clean water, non-alkaline soap and clean towels. This interpretation of 1926.51(f)(1) and 1915.97(b) is consistent with the evidence in the Cr(VI) rulemaking record and with OSHA's previous interpretations of these standards.

**Inhalation Hazards / PELs:** Inhalation of dry portland cement may cause irritation to the moist mucous membranes of the nose, throat and upper respiratory system, or may cause or aggravate certain lung diseases or conditions. Although portland cement is not recognized as a carcinogen by NTP, OSHA, or IARC, it generally contains small amounts of substances, such as crystalline silica and Cr(VI), which are recognized as carcinogens by these organizations.

OSHA's PELs for both portland cement and particulates not otherwise regulated (PNOR) are 15 mg/m<sup>3</sup> as total dust, and 5 mg/m<sup>3</sup> for the respirable fraction where listed. Because there are only trace amounts of Cr(VI) in portland cement, these PELs provide greater protection against Cr(VI) inhalation hazards than the new Cr(VI) PEL of 5 µg/m<sup>3</sup>; that is, an employee exposed to 15 mg/m<sup>3</sup> of portland cement dust with a Cr(VI) concentration below 20 µg/g, will be exposed to less than 0.3 µg/m<sup>3</sup> of Cr(VI).

Compliance officers must confirm that concentrations of portland cement dust are at or below the 15 mg/m<sup>3</sup> PEL. If maintaining portland cement exposure levels below 15 mg/m<sup>3</sup> is not feasible, exposed employees must wear respiratory protection in accordance with [29 CFR 1910.134](#). This

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<sup>1</sup> Paragraph 29 CFR 1926.51(f)(3), which requires "hot and cold running water, or tepid running water," is only applicable to permanent places of employment where construction work is occurring; however, the general requirement in paragraph (f)(1) applies to all construction work.

would be most likely in construction operations such as terrazzo work, mixing mortar and jobsite mixing of concrete.

**Training / Hazard Communication:** Portland cement is considered a hazardous chemical under OSHA’s Hazard Communication standard, [29 CFR 1910.1200](#) (HCS), and should be included in the employer’s hazard communication program. Employers whose employees are exposed to portland cement must provide appropriate training (discussed below), maintain labels and copies of MSDSs for portland cement in their workplaces, and ensure that these documents are readily accessible during each work shift.

HCS also requires chemical manufacturers and importers to assess the hazards of chemicals that they produce or import and disseminate information regarding those hazards. Among other information, each MSDS must identify the hazardous chemicals it pertains to, and the health hazards presented by those chemicals, “including signs and symptoms of exposure,” as well as generally applicable precautions for safe handling and use and control measures. 29 CFR 1910.1200(g).

Because portland cement is a mixture, HCS provides two ways in which the MSDS can list the hazardous chemicals it contains. If the mixture is tested as a whole to determine its hazards, the standard allows the MSDS to list only “the ingredients which contribute to these known hazards.” For a mixture that has not been tested as a whole, the MSDS must include the ingredient(s) present in a concentration below 1% (0.1% for a carcinogens) – as is likely for the Cr(VI) in portland cement – “if there is evidence that the ingredients(s) could be released from the mixture in concentrations which ... could present a health risk to employees” (as well as in other circumstances not relevant here).

MSDSs for portland cement are expected to indicate the dermal and inhalation hazards described above. Because there is evidence that exposure to the Cr(VI) in portland cement could cause sensitization and allergic dermatitis, MSDSs for portland cement that is contaminated by Cr(VI) are expected to indicate the presence of Cr(VI) and to address this hazard. Compliance officers are to address deficiencies in MSDSs in accordance with [CPL 02-02-038](#), Inspection Procedures for the Hazard Communication Standard.

OSHA’s general construction training standard, [29 CFR 1926.21](#)(b), and the HCS training provision, 29 CFR 1910.1200(h), are applicable to operations with portland cement exposure. Compliance officers must verify that employers are complying with these provisions by instructing employees working with portland cement about the hazards of portland cement, including any hazards associated with the cement’s Cr(VI) content.

**Inspection Checklist:** At every inspection site where the OSHA compliance officer encounters employees working with portland cement, the officer shall determine, at a minimum, the employer’s compliance with the general standards described above. A [checklist](#) is provided on the following page to assist compliance officers in these worksite inspections. This checklist sets forth the specific provisions of these general standards that employers must follow in order to control the inhalation, dermal, and eye hazards associated with exposures to portland cement.

This inspection checklist was also previously forwarded to OSHA Regional Administrators and State Designees on April 16, 2007, with instructions to begin using it on all construction site inspections in Federal plan states where there were exposures to portland cement. This action was taken as part of a settlement to a legal challenge against the construction Cr(VI) standard from the Building and Construction Trades Department (BCTD), AFL-CIO, Laborers' International Union of North America, and International Brotherhood of Teamsters. The [BCTD Settlement Agreement](#) was signed April 6, 2007. A copy of this agreement and of OSHA's [Memorandum to its Regional Administrators and State Designees, April 16, 2007](#), to begin using these procedures for portland cement on construction site inspections, may be found on OSHA's website. With the issuance of this Cr(VI) Directive, these same inspection procedures are also to be used where exposures to portland cement are found in general industry and shipyards.

Further health and safety information on the concrete industry is available at the OSHA website's Safety and Health Topics Page on [Concrete and Concrete Products - Manufacturing and Construction](#).

## **INSPECTION CHECKLIST FOR WORKSITES WITH PORTLAND CEMENT**

- PPE [[1910.132](#), [1915.152](#), [1926.95](#)]:
  - Appropriate PPE, such as boots and gloves, is provided wherever necessary and appropriate for the job.
  - Employees can clean or exchange PPE if it becomes ineffective or contaminated on the inside with portland cement while in use.
  - Equipment is maintained in a sanitary and reliable condition when not in use.
- Sanitation [[1910.141\(d\)](#), [1915.97\(b\)](#), [1926.51\(f\)\(1\)](#)]:
  - Washing facilities provided with clean water, non-alkaline soap, and clean towels.
  - Washing facilities are in near proximity to the worksite and adequate for the number of exposed employee and the size of the job.
- Airborne exposures [[1910.1000](#), [1915.1000](#), [1926.55](#), [1910.134](#)]:
  - 8-hour TWA exposures to portland cement or particulates not otherwise regulated (PNOR) do not exceed 15 mg/m<sup>3</sup> PEL as total dust.
  - Construction operations with potential inhalation exposures include, but are not limited to, terrazzo work, mixing mortar, and mixing concrete.
  - Where exposures exceed the PEL, employees are provided respirators.
- Hazard communication and training [[1910.1200](#), [1926.21](#)]:
  - MSDSs and labels for portland cement are maintained and made available to employees.
  - MSDSs indicate the hazards of portland cement, including hazards associated with the cement's hexavalent chromium content.
  - Employees are trained on:
    - Hazards associated with exposure to portland cement, including hazards associated with the cement's hexavalent chromium content.
    - Preventive measures, including proper use and care of PPE, and the importance of proper hygiene practice.
    - Access to hygiene facilities, PPE, and information (including MSDSs)
- Recordkeeping [[1904](#)]:
  - Employer records each case of occupational dermatitis that meets the recordability criteria in [1904.4](#) in illness and injury logs.
  - Employer informs employees of how to report their work-related illnesses and injuries.

## **Section C-2. Operations with Cr(VI) Pesticides**

The Cr(VI) standards do not apply where there are exposures to Cr(VI) in the *application* of pesticides for wood treatment, such as chromated copper arsenate (CCA) and acid copper chromate (ACC). Applications of these pesticides are instead regulated by the EPA. However, the standards do apply where Cr(VI) exposures occur either in the *manufacture* of Cr(VI) pesticides, or while *using or otherwise handling* wood products treated with Cr(VI) pesticides. These standards would also apply to employees working adjacent to or inside work areas where an exempt employer is applying or has recently applied Cr(VI) pesticides.

OSHA's exposure profile for woodworking indicated that construction work using wood treated with pesticides containing Cr(VI) involved Cr(VI) exposures above the new PEL (up to 30 percent exceeded the PEL). The compliance officer should also remember that CCA is a common wood preservative chemical, which contains both Cr(VI) and inorganic arsenic, each regulated by a substance-specific standard. Refer to this Directive's [Chapter X, Section A.5](#), which explains OSHA's enforcement policy for application of the two standards for this exposure situation.

Where a compliance officer encounters operations involving applications of Cr(VI) pesticides to wood products, and there are concerns about compliance with environmental regulations, a referral to the EPA may be made through the Regional Office.

Also, as explained in Chapter X of this Directive, OSHA has a separate directive for state consultation services applicable to arsenical pesticides that could be impacted by the new Cr(VI) standards. This older directive, [CSP 02-01-001](#), *Consultation for Wood Treatment Operations Utilizing Inorganic Compounds*, 9/09/1986, established policy for State 7(c)(1) consultation services to the wood preservative industry. [Since this date, the OSH Act was amended in 1998 and State consultation services are now under 21(d).] This newer Cr(VI) Directive further advises state consultants to use the new Cr(VI) standards and this Cr(VI) Directive as a source of information and guidance for the employer. See [Chapter X, Section A.5](#).

### **Section C-3. Cr(VI) Operations Excluded with Objective Data**

The Cr(VI) standards do not apply where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI), under any expected conditions of use, in concentrations at or above  $0.5 \mu\text{g}/\text{m}^3$ .

As an example, the employer may have objective data in the form of documentation from an industry group or trade association showing that the Cr(VI) fraction of workplace dusts would be such that compliance with the PEL for nuisance particulates of  $15 \text{ mg}/\text{m}^3$  yields an airborne exposure to Cr(VI) below the exclusion criterion of  $0.5 \mu\text{g}/\text{m}^3$ .

A similar example could involve an employer performing remediation of Cr(VI)-contaminated soil, say at a Superfund site. If the employer has soil sampling data that reasonably characterize the Cr(VI) concentrations within the soil as less than 30 parts per million, and the employer has previously monitored the employees' airborne dust exposures at this worksite under all expected conditions of soil remediation work and determined with 95% confidence and +/- 25% accuracy that employee exposures to total dust do not exceed the PEL of  $15 \text{ mg}/\text{m}^3$  (reference [1910.1000, Table Z-1](#), particulates not otherwise regulated, total dust), then the employer may perform an exposure determination for airborne Cr(VI) by multiplying the soil Cr(VI) concentration by the maximum total airborne dust exposures, yielding maximum Cr(VI) exposures that do not exceed  $0.45 \mu\text{g}/\text{m}^3$ .

See [Chapter IX, Sections A.2.c, D.2, and M.5-6](#) for specific enforcement procedures if the employer's objective data are absent or inadequate.

#### **Section C-4. SFIC-Party Electroplating Facilities Excluded from Respirator Provisions**

Some employers with electroplating job shops have voluntarily agreed to accelerate implementation of engineering and work practice controls in order to be relieved of certain respiratory protection provisions in the general industry Cr(VI) standard. These employers have opted-in to the SFIC settlement agreement contained in Appendix A to 1910.1026.

Eligible SFIC members and other metal- and surface-finishing job shop facilities could become parties to this agreement by following the instructions in the Federal Register ([71 FR 63238-63245, Oct. 30, 2006](#)). An employer's facility was eligible to become a party to the agreement if (1) the employer was a member of SFIC or the facility was a surface-finishing or metal-finishing job shop that sells plating or anodizing services to other companies; and (2) the facility was within the jurisdiction of federal OSHA. The terms of the agreement applied only to surface- and metal-finishing operations in those facilities. The deadline for an employer to choose to have its facility become a party to the agreement was November 30, 2006 (the Opt-in Date), and was accomplished by the employer filling out a form ("Declaration of Party Status") available on OSHA's website, and mailing or faxing it to OSHA's Office of Health Enforcement.

The agreement created an optional, alternative compliance timetable for metal- and surface-finishing operations at eligible worksites. Facilities that elected to participate agreed to implement engineering controls on an expedited schedule (by December 31, 2008), but will have relief from certain respirator requirements in the interim. Although the agreement provided participating electroplating facilities with temporary, limited relief from short-term respirator requirements, provisions in the agreement ensured that those facilities would still provide respirators in certain situations, e.g., for certain metal-finishing tasks when exposures exceed the PEL and for any other employees who request respiratory protection.

**Accelerated Implementation of Engineering Controls:** Facilities that became parties to the agreement must implement feasible engineering controls necessary to reduce hexavalent chromium levels at their facilities to or below the  $5 \mu\text{g}/\text{m}^3$  PEL, in accordance with 1910.1026(f)(1), by December 31, 2008. In fulfilling this obligation, the facilities may select from the engineering and work practice controls listed in Exhibit A to the settlement agreement or adopt any other controls.

**Respirator Enforcement:** With the exception of the six classes of employees described below, OSHA has agreed not to enforce the respirator protection provisions at 1910.1026(f) and (g) prior to December 31, 2008, for metal- and surface-finishing operations in facilities that are parties to, and are complying with, the agreement. The six classes of employees for which OSHA will enforce all of the standard's respiratory protection provisions are as follows:

- (1) Employees who are exposed to Cr(VI) in excess of the PEL while performing tasks described in Exhibit B to the Agreement. These tasks, as described more completely in Exhibit B, include Cr(VI) chemical additions, Cr(VI) preparation and mixing, Cr(VI) tank cleaning, and Cr(VI) painting operations.

- (2) Through November 30, 2007, employees whose exposures to Cr(VI) exceed an interim “respirator threshold” of  $20 \mu\text{g}/\text{m}^3$  (measured as an 8-hour time-weighted average).
- (3) Beginning December 1, 2007, employees whose exposures to Cr(VI) exceed an interim “respirator threshold” of  $12.5 \mu\text{g}/\text{m}^3$  (measured as an 8-hour time-weighted average).
- (4) Employees who are exposed to Cr(VI) and request a respirator.
- (5) Any other employees who are required by their employers to wear a respirator.
- (6) Employees with exposures for which respirators were required for exposure to chromic acid and chromates under the previous Air Contaminants standard at 29 CFR 1910.1000, and any other employees covered by respirator programs in effect on May 30, 2006.

**Compliance Plan and Monitoring:** The standard requires all employers, including facilities that are parties to the agreement, to make an initial exposure determination for each employee exposed to Cr(VI). Facilities that are party to the agreement may do this using either the monitoring option described at 1910.1026(d)(2)(i) (which involves taking a sufficient number of personal breathing zone air samples to accurately characterize full shift exposure on each shift, for each job classification, in each work area) or the performance-oriented option described at 1910.1026(d)(3) (which involves using any combination of air monitoring data, historical monitoring data, or objective data sufficient to accurately characterize employee exposures).

Thereafter, each facility that is a party to the agreement must conduct periodic monitoring in accordance with the scheduled monitoring option provision at 1910.1026(d)(2). Under this provision, if monitoring reveals employee exposures to be above the PEL, the employer shall perform periodic monitoring at least every three months. If monitoring reveals employee exposures to be at or above the action level of  $2.5 \mu\text{g}/\text{m}^3$  (as an 8-hour TWA), but below the PEL, the employer shall perform periodic monitoring at least every six months. If monitoring indicates that employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

The standard requires employers to notify employees whenever an exposure determination indicates exposures above the PEL. This notification must be in writing and must describe the corrective actions being taken to reduce employee exposures to or below the PEL, 1910.1026(d)(4). In accordance with this requirement, facilities that are party to the agreement must prepare a written compliance plan that sets forth the specific control steps being taken to reduce exposures to or below the PEL and must update that plan each time monitoring reveals exposures above the PEL. Upon request, compliance plans and monitoring results must be provided to OSHA, affected employees and employee representatives.

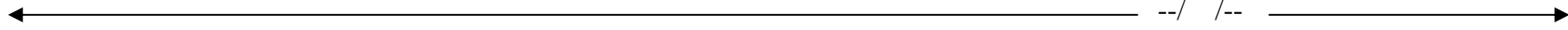
**Training:** In addition to training employees as required by 1910.1026(l)(2), facilities that are parties to the agreement must train their employees in the provisions of the agreement within sixty (60) days of the Opt-in Date (i.e., by January 29, 2007). This training must be provided in a manner and language the employees can understand.



Attached to this appendix are a table and a timeline that summarize the terms of the SFIC settlement agreement in order to assist the compliance officer's understanding of all the provisions, dates, and enforcement procedures required for this relatively small group of employers. A second [table](#) attached, lists the 27 facilities located in federal OSHA states, where the employers elected to opt-in to the SFIC settlement agreement. A separate copy of the [SFIC Settlement Agreement](#) may be found on the OSHA website.

## Timeline of Dates for Electroplating Facilities Party to OSHA-SFIC Settlement Agreement Signed October 25, 2006

Cr(VI) Start-up Date (≥ 20 employees)	SFIC Opt-in Date (Electroplaters)	SFIC Training Date (within 60 days)	Cr(VI) Start-up Date (≤ 19 employees)	SFIC Interim Threshold Date (from 20 to 12.5 µg/m <sup>3</sup> TWA)	SFIC Deadline (Engineering controls)	Cr(VI) Deadline (Engineering Controls)
Nov. 27, 2006	Nov. 30, 2006	Jan. 29, 2007	May 30, 2007	Dec. 1, 2007	Dec. 31, 2008	May 31, 2010



^^

Non-participating employers with 20 or more employees shall comply with all Cr(VI) provisions, except engineering controls shall be implemented no later than May 31, 2010.

..... ^^

Deadline for employers of electroplating facilities to opt-in to settlement agreement. If CSHO measures Cr(VI) exposures exceeding 20 µg/m<sup>3</sup>, enforce the respirator provisions.

..... ^^

SFIC-party employers shall have trained their employees in the provisions of the agreement within 60 days of the Opt-in Date.

..... ^^

Non-participating employers with 19 or fewer employees shall comply with all Cr(VI) provisions except engineering controls. If CSHO measures Cr(VI) exposure exceeding 5 µg/m<sup>3</sup>, cite violation unless respirators are being used to comply with Cr(VI) PEL, and inform employer to begin plans for implementing feasible engineering controls by May 31, 2010.

..... ^^

For SFIC-party employers, if CSHO measures Cr(VI) exposures exceeding 12.5 µg/m<sup>3</sup>, enforce the respirator provisions.

..... ^^

SFIC-party employers shall have installed feasible engineering controls. If CSHO measures Cr(VI) exposures exceeding 5 µg/m<sup>3</sup>, enforce all provisions of the standard.

..... ^^

Non-participating employers shall have installed feasible engineering controls.

**Table 1. Summary of Terms of SFIC Settlement Agreement  
for Opted-in Electroplating Facilities with Cr(VI) Exposures**

<b>Non-Participating Electroplaters and All Other Employers in Compliance with Cr(VI) Standard</b>	<b>SFIC-Party Facilities (Electroplaters) Under Terms of Settlement Agreement Which Have Opted-in by the Deadline of Nov. 30, 2006</b>
<b>Implementation of Engineering and Work Practice Controls</b>	
Implement feasible controls no later than May 31, 2010	Implement feasible controls no later than Dec. 31, 2008 (17 months earlier)
<b>Respirator Enforcement</b>	
<p>Use respiratory protection until feasible engineering and work practice controls are implemented, and wherever controls do not reduce exposures to or below the PEL of 5 µg/m<sup>3</sup> as 8-hour TWA.</p>	<p>Prior to December 31, 2008, respiratory protection is required <b>only for the following six groups of employees</b>:</p> <ol style="list-style-type: none"> <li>1. Employees exposed &gt; PEL of 5 µg/m<sup>3</sup> as 8-hour TWA while performing these 4 tasks – <ul style="list-style-type: none"> <li>• Adding Cr(VI) chemicals to tanks</li> <li>• Mixing Cr(VI) solutions</li> <li>• Cleaning Cr(VI) plating tanks</li> <li>• Spraying Cr(VI) paints</li> </ul> </li> <li>2. Employees exposed &gt; interim respirator threshold of 20 µg/m<sup>3</sup> as 8-hour TWA through Nov. 30, 2007.</li> <li>3. Employees exposed &gt; interim respirator threshold of 12.5 µg/m<sup>3</sup> as 8-hour TWA from Dec. 1, 2007 until Dec. 31, 2008.</li> <li>4. Employees who are exposed to Cr(VI) and request a respirator.</li> <li>5. Employees required by their employer to wear a respirator.</li> <li>6. Employees with exposures to chromic acid and chromates for which respirators were required under the previous standard (1910.1000) and any other employees covered by respirator programs in effect on May 30, 2006.</li> </ol>

**Table 1. (Continued) Summary of Terms of SFIC Settlement Agreement  
for Opted-in Electroplating Facilities with Cr(VI) Exposures**

Non-Participating Electroplaters and All Other Employers in Compliance with Cr(VI) Standard	SFIC-Party Facilities (Electroplaters) Under Terms of Settlement Agreement Which Have Opted-in by the Deadline of Nov. 30, 2006
<b>Exposure Determination</b>	
Determine employee exposures following either the Scheduled Monitoring Option, 1910.1026(d)(2), or the Performance-Oriented Option, 1910.1026(d)(3).	Initially determine employee exposures following either the Scheduled Monitoring Option, 1910.1026(d)(2)(i), or the Performance-Oriented Option, 1910.1026(d)(3). Thereafter, conduct periodic monitoring in accordance with the Scheduled Monitoring Option, 1910.1026(d)(2)(ii)-(vi), until Dec. 31, 2008.
Whenever employee exposure > PEL, the employer's written notification to affected employees shall describe the corrective action being taken to reduce exposures.	Whenever employee exposure > PEL, the employer's written notification to affected employees shall describe the corrective action being taken to reduce exposures. This notification is called the <b>written compliance plan</b> under the Agreement.
<b>Training</b>	
<p>By Nov. 27, 2006, for large employers (<math>\geq 20</math> employees) or May 30, 2007, for small employers (<math>\leq 19</math> employees), the employer shall ensure employees can demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Contents of Cr(VI) standard; and,</li> <li>• Purpose and description of the medical surveillance program.</li> </ul>	<p>By Nov. 27, 2006, for large employers (<math>\geq 20</math> employees) or May 30, 2007, for small employers (<math>\leq 19</math> employees), the employer shall ensure employees can demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Contents of Cr(VI) standard; and,</li> <li>• Purpose and description of the medical surveillance program.</li> </ul> <p>By Jan. 29, 2007, for all SFIC-party facilities, employers shall ensure employees are <b>trained in the provisions of the SFIC Agreement</b>.</p>

**Table 2. Electroplating Facilities Within Federal OSHA States  
Which Opted-in to SFIC Settlement Agreement for Chromium (VI) General Industry Standard, 1910.1026**

OSHA Region	Employer	Authorized Representative	Title	Facility Phone	Facility Contact	Title	Facility Street Address	City	State	ZIP
1	Allied Metal Finishing, LLC	Joseph A. Toce	General Manager	860.290.8865	Joseph A. Toce	General Manager	379 Chapel Road	South Windsor	CT	06074
1	Donham Craft, Inc.	Patrick Hayden	VP Operations	203.729.8244	Patrick Hayden	VP Operations	15 East Waterbury Rd	Naugatuck	CT	06770
1	Seaboard Metal Finishing Co., Inc.	Steven D. Tarrantino	President	203.933.1603	Steven D. Tarrantino	President	50 Fresh Meadow Road	West Haven	CT	6516
2	Anoplate Corporation	Milton F. Stevenson, Jr.	Chief Environmental Officer	315.471.6143 ext. 150	Milton F. Stevenson, Jr.	Chief Environmental Officer	459 Pulaski Street	Syracuse	NY	13204
2	General Superplating Co., Inc.	William W. Southwell	Vice President / General Manager	315.446.2264	Karen Lee	EH&S Manager	5762 Celi Drive	East Syracuse	NY	13057
3	Apollo Metals	William E. Flederbach	COO	610.867.5826	William E. Flederbach	COO	1001 14th Ave.	Bethlehem	PA	18018
4	MAFCO, Inc.	Frank Borza	President	727.584.1210	Frank Borza	President	13250 95th St., N	Largo	FL	33773
4	Peninsula Metal Finishing	David Roach	President	407.291.1023	David Roach	President	2550 Dinneen Ave.	Orlando	FL	32804
5	AMAC Enterprises, Inc.	Constantine Chimples	President	216.362.1880	Constantine Chimples	President	5909 W. 130th St.	Parma	OH	44130
5	Gem Coat, Inc.	Jay Slaughter	President	773.774.2244	Jay Slaughter	President	6553 N. Olmstead Ave.	Chicago	IL	60631
5	Hale Chrome Service, Inc.	Frederick M. Deye	President	419.244.6451	Frederick M. Deye	President	2282 Albion St.	Toledo	OH	43606
5	Hausner Hard-Chrome Hohman Plating & Manufacturing, Inc.	Jeff Hausner	President	847.439.6027	Dale Sladek	General Manager	670 Greenleaf Ave.	Elk Grove Village	IL	60007
5		William T. Miller	President	937.228.2191	Angela Vance	H&S Coordinator	814 Hillrose Avenue	Dayton	OH	45404
5	Newark Electro Plating, Inc.	Michael Zelein	Technical Manager	740.349.8369	Michael Zelein	Technical Manager	30-32 E. Harrison Street	Newark	OH	43055
5	Teikuro Corporation	Michael L. Houseman	VP Operations	937.325.9900	Joe Sterling	H&S Manager	4500 Gateway Blvd.	Springfield	OH	45502
5	United Hard Chrome Corp.	Robert Horger	President	330.453.2786	Robert Horger	President	2202 Gilbert Ave., NE	Canton	OH	44705
6	Commercial Plating Company	Michael W. Piel	President	314.867.4212	Michael W. Piel	President	9100 Riverview Dr.	St. Louis	MO	63137
6	Dixie Electroplating Co.	Paul J. Coselli	President	713.224.1826	Ashley Coselli	Environmental Manager	3001 Engelke St.	Houston	TX	77003
6	H&M Plating Company, Inc.	Garry Hamby	Vice President	713.643.6516	Garry Hamby	Vice President	6035 Plainview St.	Houston	TX	77087
6	Industrial Chrome Plate, Inc.	Chuck Deans	EHS Manager	210.226.1261	Chuck Deans	EHS Manager	2805 S. Flores St.	San Antonio	TX	78204
6	Schumacher Co., Inc.	Paul J. Coselli	President	713.923.5548	Tony Facciolo	Environmental Coordinator	5610 Polk St.	Houston	TX	77023
7	Goad Company	Curtis C. Goad	President	636.394.6334	Curtis C. Goad	President	260 Old State Road	Ellisville	MO	63021
7	Goad Company	Curtis C. Goad	President	816.736.2100	Curtis C. Goad	President	144 South Kentucky Ave.	Independence	MO	64053
7	Lincoln Plating	James E. Small	Safety Manager	402.475.3671	James E. Small	Safety Manager	600 West E. Street	Lincoln	NE	68522
7	M & R Plating, Inc.	Marlin Schweich	President/Owner	636.239.3427	Marlin Schweich	President/Owner	303 Westlink Industrial Dr.	Washington	MO	63090
7	Microfinish Co., Inc.	William M. Stock	President	314.220.1013	William M. Stock	President	8353 Courtney Ave.	St. Louis	MO	63140
7	Sullivan Precision Metal Finishing	Don Scowden	Sr. Vice President	573.468.8049	Don Scowden	Sr. Vice President	995 North Service Rd., W	Sullivan	MO	63080

## APPENDIX D

### ACRONYMS

ACC	acid copper chromate
ACGIH <sup>®</sup>	American Conference of Governmental Industrial Hygienists <sup>®</sup>
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
APF	assigned protection factor
BCTD	Building and Construction Trades Department
BEIs <sup>®</sup>	Biological Exposure Indices <sup>®</sup>
CAA	Clean Air Act
CCA	chromated copper arsenate
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CFR	Code of Federal Regulations
CPL	Enforcement and Compliance Directive
Cr	chromium
CrO <sub>3</sub>	chromium oxide, chromium trioxide, or chromic acid
Cr(VI)	hexavalent chromium
Cr <sup>+6</sup>	hexavalent chromium ion
CSHO	compliance safety and health officer
CSI	Chemical Sampling Information
CSP	Cooperative and State Programs Directive
CTC	Cincinnati Technical Center
EPA	Environmental Protection Agency
FCAW	flux-cored arc welding
FGR	fume generation rate
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FIRM	Field Inspection Reference Manual
FR	Federal Register
GMAW	gas metal arc welding
GTAW	gas tungsten arc welding
HCS	Hazard Communication standard
HEPA	high efficiency particulate air
HRG	Public Citizen Health Research Group
IARC	International Agency for Research on Cancer
ISO	International Organization for Standardization
MIG	metal inert gas (welding)
MMA	manual metal arc (stick welding)
MSDS	Material Safety Data Sheet
NaOHqz	binderless quartz fiber filter coated with sodium hydroxide
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OHE	Office of Health Enforcement

OSH Act	Occupational Safety and Health Act of 1970
OSHA	Occupational Safety and Health Administration
OTM	OSHA Technical Manual
PAPR	powered air purifying respirator
PbCrO <sub>4</sub>	lead chromate
PEL	permissible exposure limit
PER	Human Resources Management Directive
PLHCP	physician or other licensed health care professional
PNOR	particulates not otherwise regulated
PPE	personal protective equipment
ppm	parts per million
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
REL	recommended exposure limit
SAE	sampling and analytical error
SAVE	standard alleged violation element
SAW	submerged arc welding
SFIC	Surface Finishing Industry Council
SLTC	Salt Lake Technical Center
SMAW	shielded metal arc welding (stick welding)
STD	Standards Directive
TED	Training and Education Directive
TIG	tungsten inert gas (welding)
TSCA	Toxic Substances Control Act
TWA	time-weighted average
USC	United States Code
µg/m <sup>3</sup>	micrograms per cubic meter

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